TECHNOLOGY DEPT.

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Gas Journal

Vol. 265. 103rd Year. LONDON, MARCH 7, 1951. No. 4579. Price 1/-

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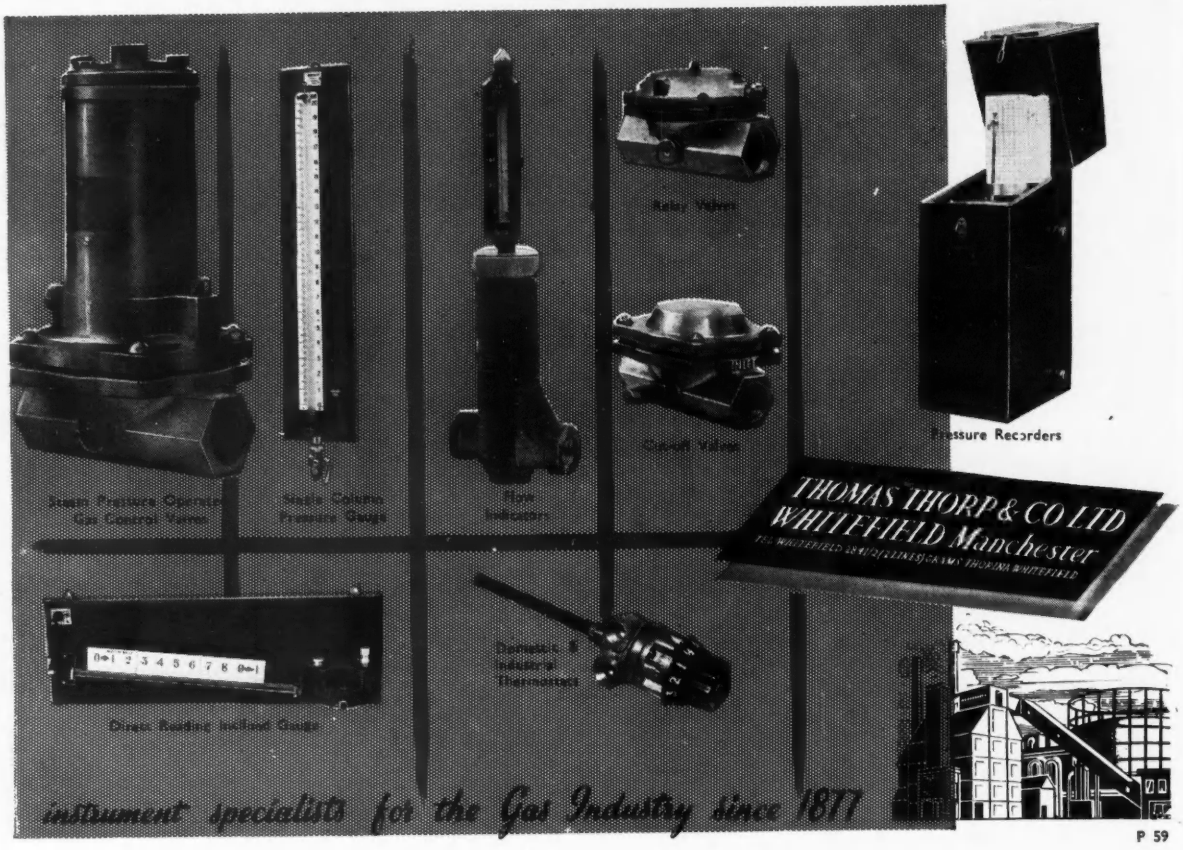

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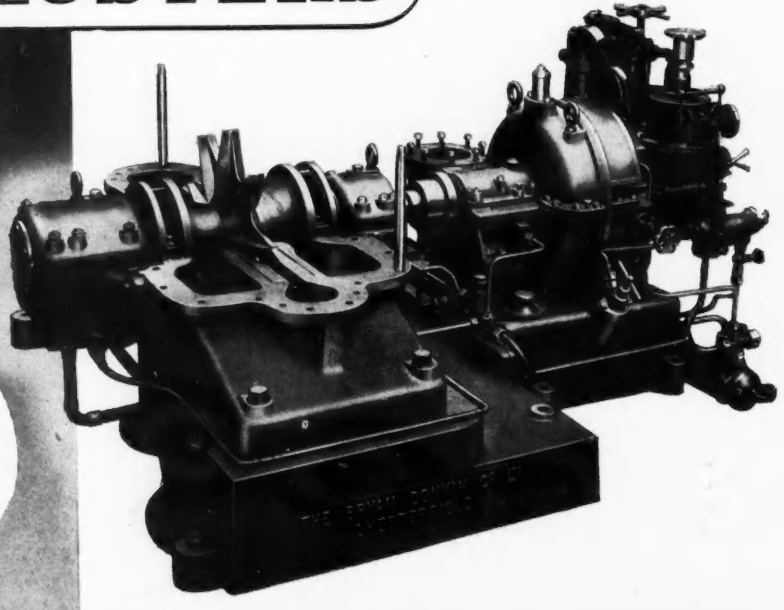
EXHAUSTERS



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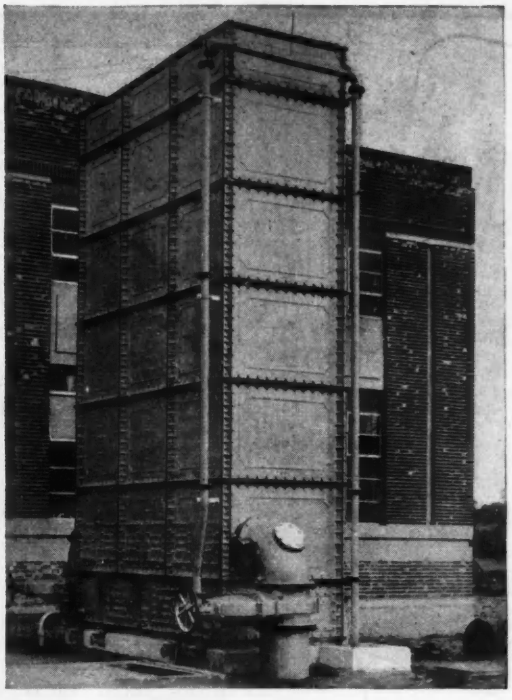

Condensers

by

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Constructional Gas & Chemical Engineers

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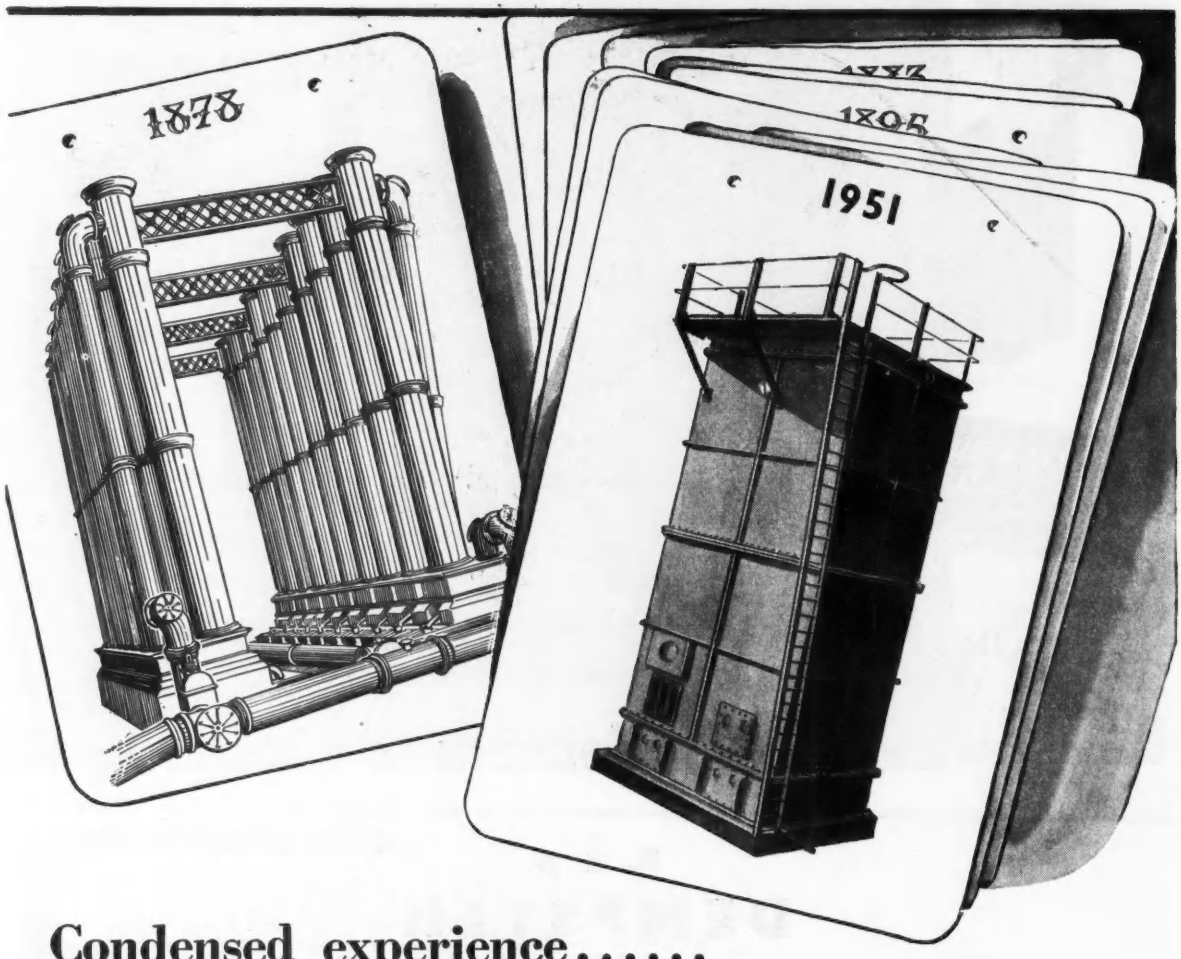

Condensed experience.....

Developments of the early atmospheric type of condenser shown here are still used but their limited capacity and the lack of effective control of temperature reduces their present-day applications. Although the principle of condensation has hardly altered since the pioneering days of the gas industry, continual research has led to new techniques and refinements that overcome many of the faults of old plants.

Among these is the question of tube corrosion due to water impurities, a problem that has been carefully studied, but never entirely solved. Because of this, it is often found advisable to sacrifice some degree of condenser efficiency in order to facilitate cleaning and descaling. Vertical tubed condensers, having a greater accessibility, are thus often preferable to horizontal types, even though the latter have a greater all-round efficiency because of the increased gas and water velocities possible. The Balfour Supervertical Condenser illustrated is designed to combine the easier access of the Vertical Tube type with the greater gas turbulence of the Horizontal type.

But the question of the most suitable condenser plant to use cannot be answered without a careful study of operating conditions. The Balfour Organisation, backed by the condensed experience of over a century, offers an unparallelled service for the design, manufacture and installation of every type of condenser plant.

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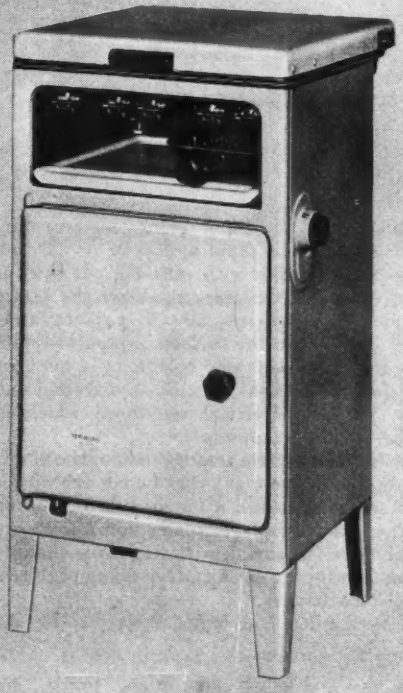

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It is rotproof, fireproof, acid resisting; is unaffected by bacteria, fungoid growths, organic solvents and soil acids; and has the high electrical resistance which is very important in pipe wrapping.
The construction and the arrangement of the non-cellular fibres in Staple Tissue mean that no oils are wicked from the bitumen and ensure a longer life for the coating.
Since 'Fibreglass' Staple Tissue cannot absorb moisture it does not swell or shrink with humidity changes, so a 'Fibreglass' wrapping means no loosening of the covering from moisture attacks.
It is easily applied and light in weight. Its lightness allows it to be supplied in longer rolls than other materials used for the same purposes and the length of the rolls saves time and labour in application as fewer stops and joins have to be made.
Its breaking strength allows winding at high speed by standard wrapping machinery at normal machine tension and it carries the normal load of bitumen impregnant without strain.
'Fibreglass' Staple Tissue is largely used as an anti-corrosive for underground pipes; small bore pipes are wrapped at the mill, and large pipes on the site.
Staple Tissue is suited to both methods of wrapping—and takes bitumen at a temperature of 450°F without turning a glass hair!

STAPLE TISSUE WRAPS THE PIPELINE Some 15,000,000 square feet of 'Fibreglass' Staple Tissue have already been used for oil pipelines in the Middle East. The above photograph shows a length of oil pipe in process of being wrapped.

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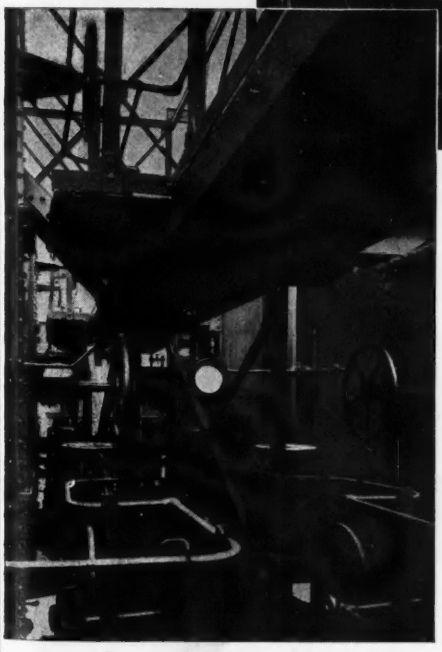
Whessoe Purifiers



The illustrations show a 4-box set of Whessoe purifiers, each 18 ft. x 18 ft. x 10 ft., with a capacity of 1½ million cu. ft. per day, for the Ormskirk Undertaking of the N.W. Gas Board.

This is a simple installation with modern features—deep, welded mild-steel, overground boxes, with divided and reversible gas flow. Simple and efficient charging is provided by Morris 3-ton skips, operated by pulley-blocks, with hoisting and traversing controlled by an electrically driven winch, which is also arranged to provide for cover-lifting.

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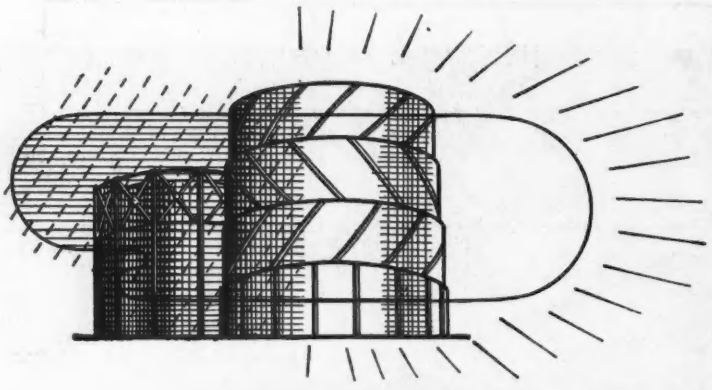

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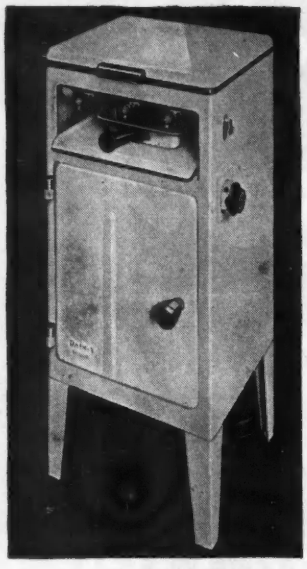
The

Dainty

MINOR



This efficient little cooker of large capacity is made especially for small kitchens and flats.

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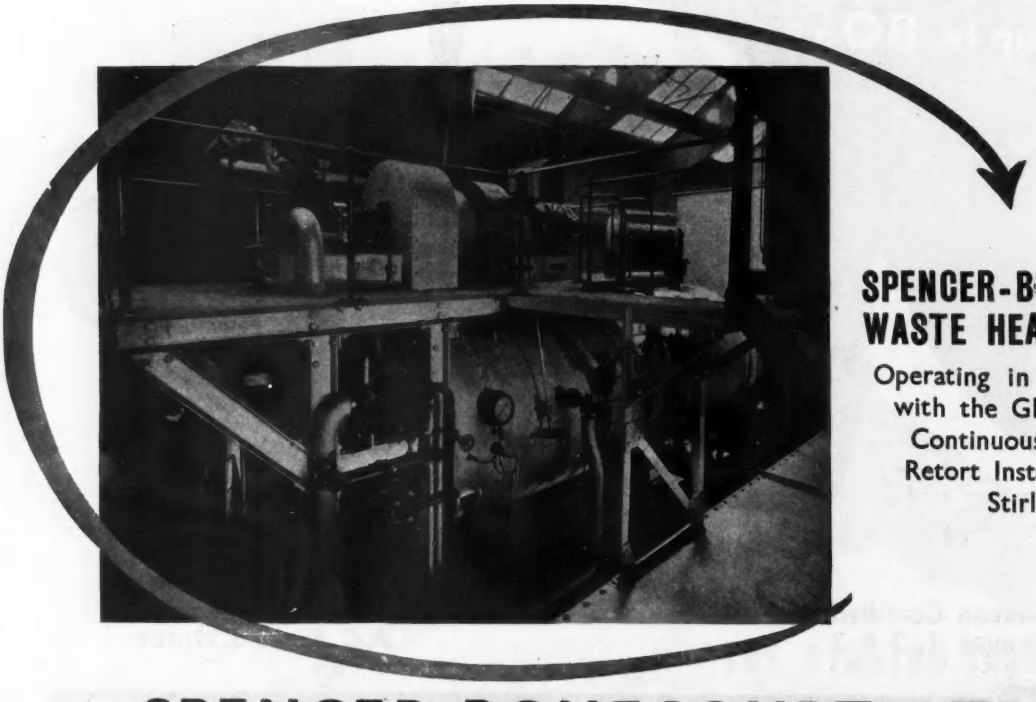

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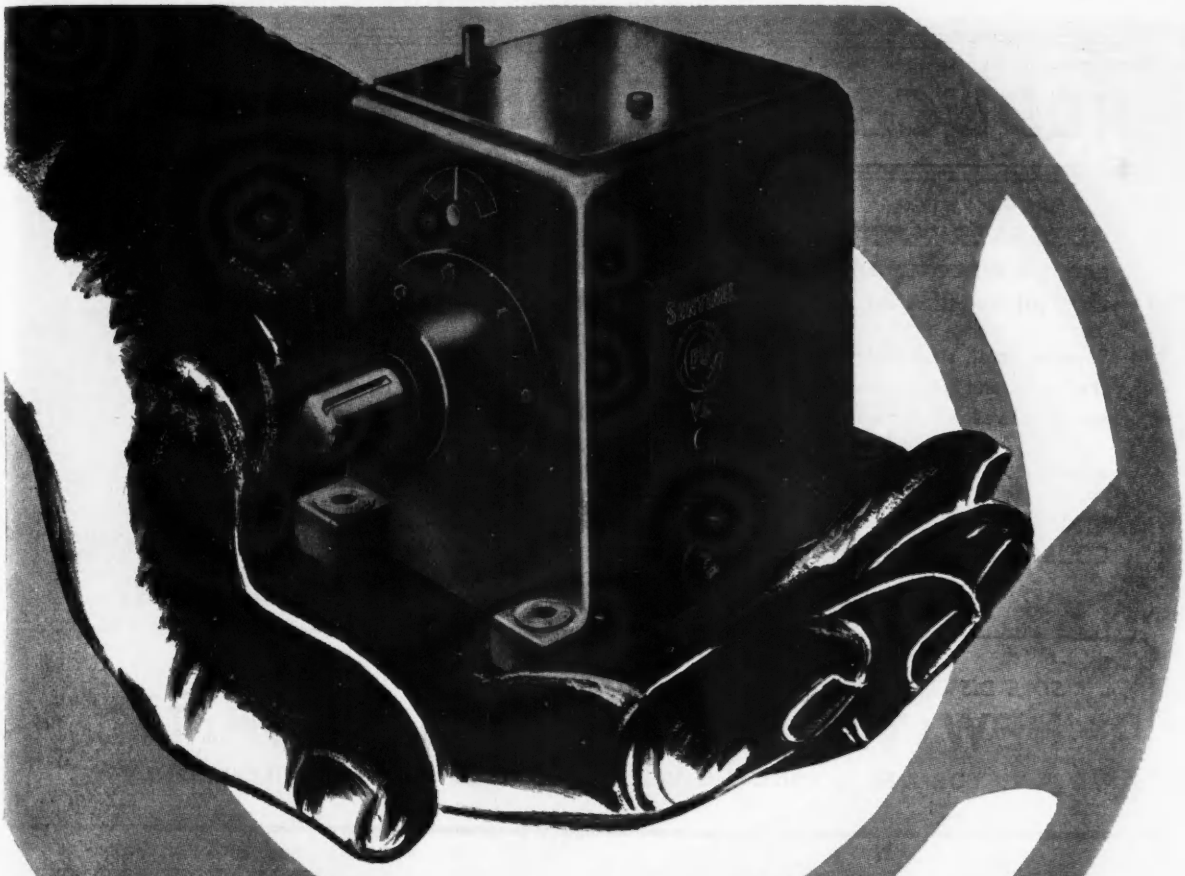

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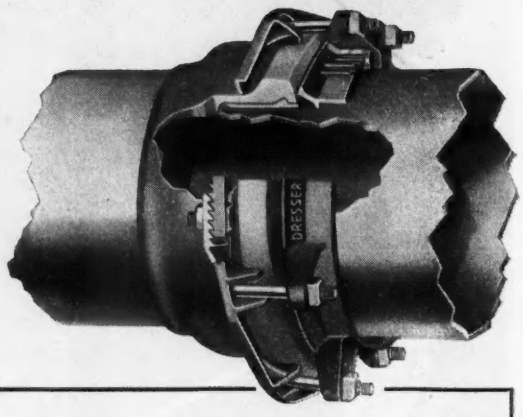

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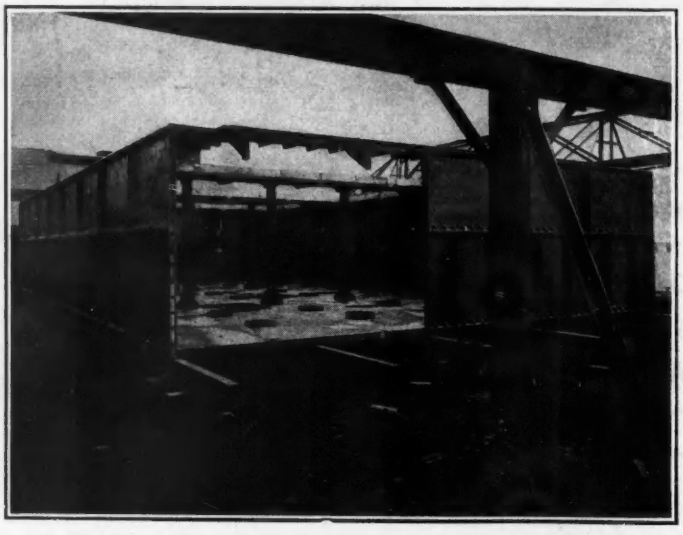

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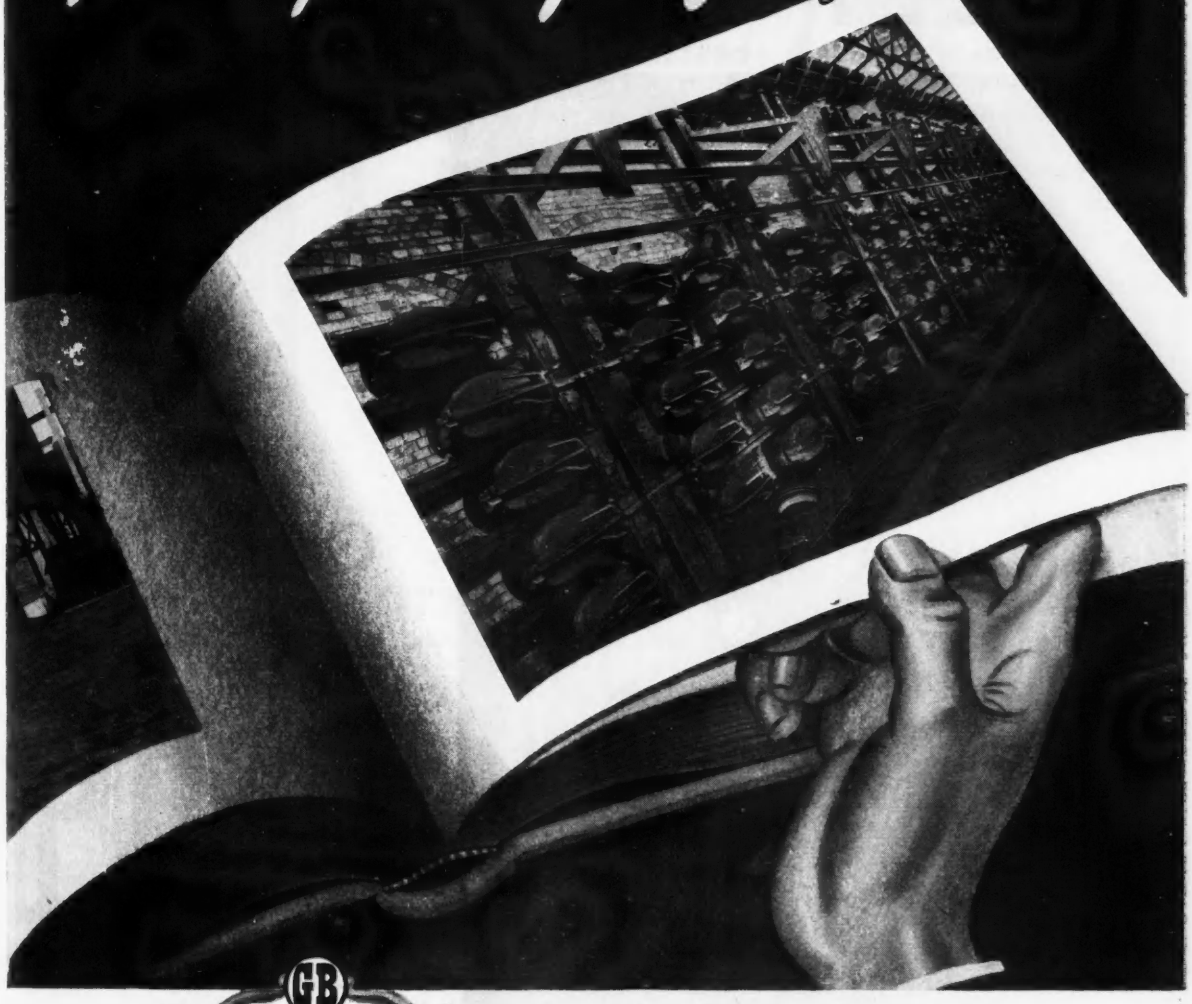

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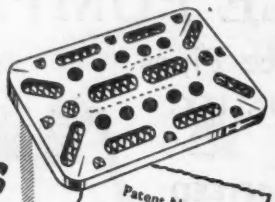
Chrome Grill Deflectors



Patent No. 520940
This is Pattern No. 2550 M for use in Met. 1 and 2 and Cannon New Challenge

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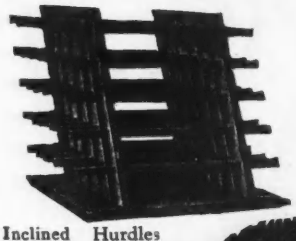

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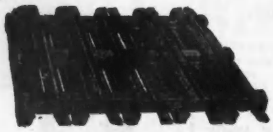

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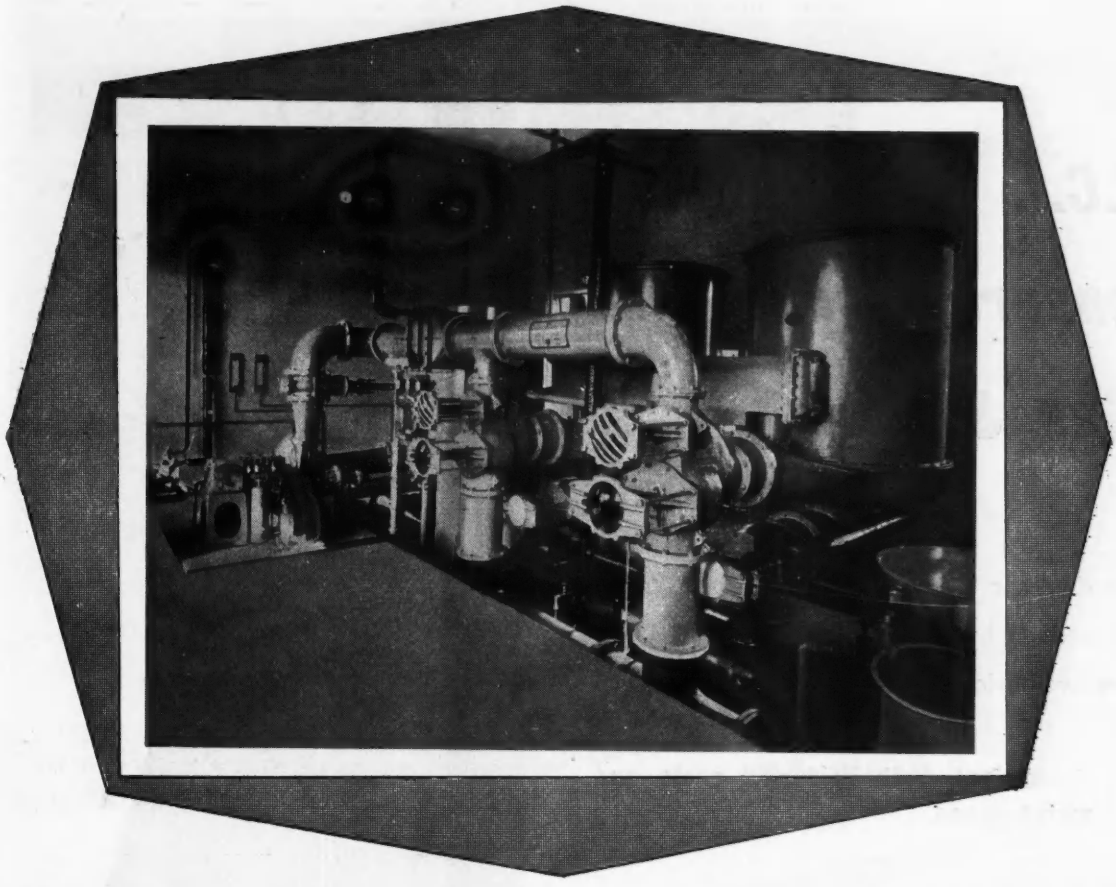

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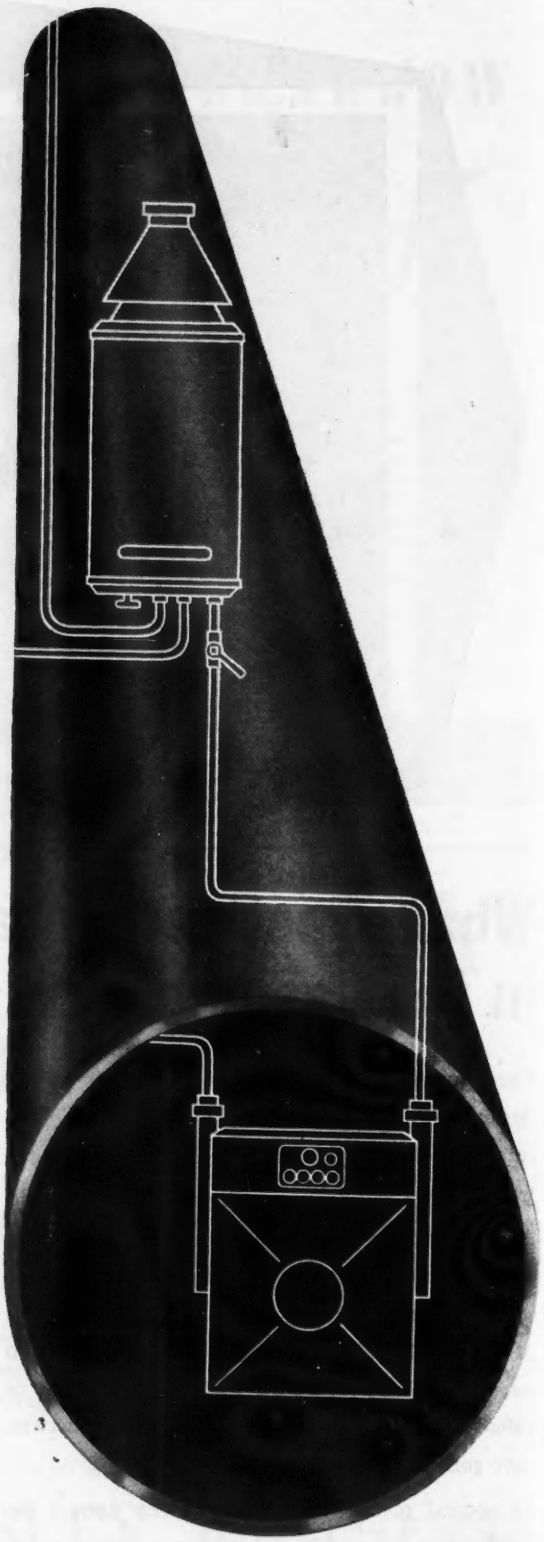
I.C.I. Copper tubes ensure trouble-free Gas Systems



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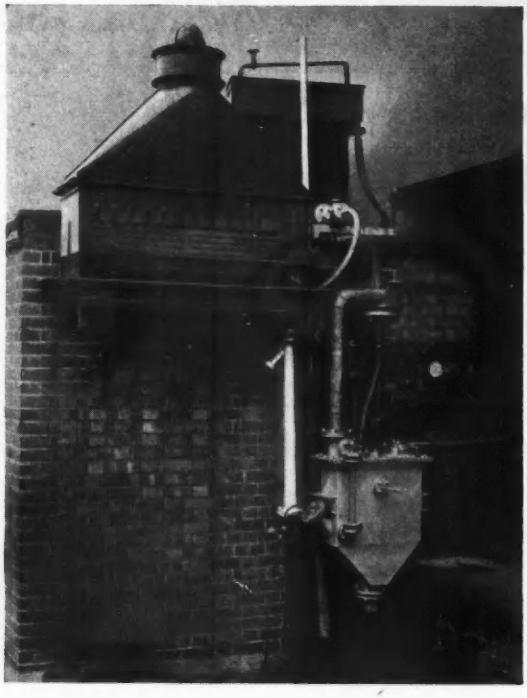

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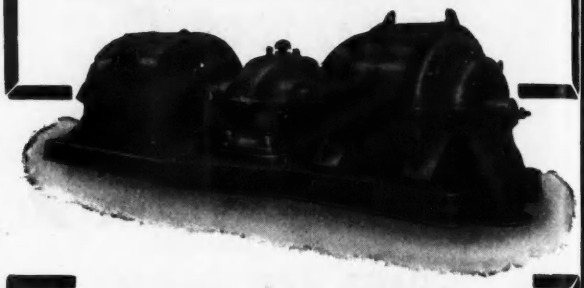

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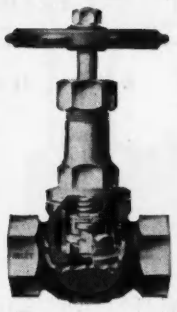

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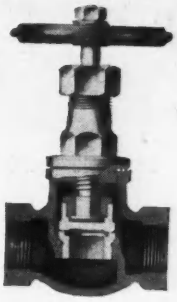

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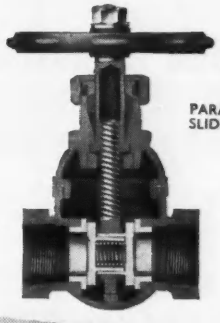

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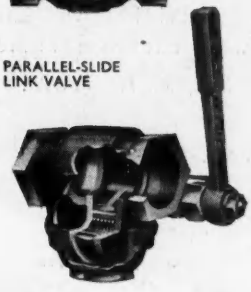

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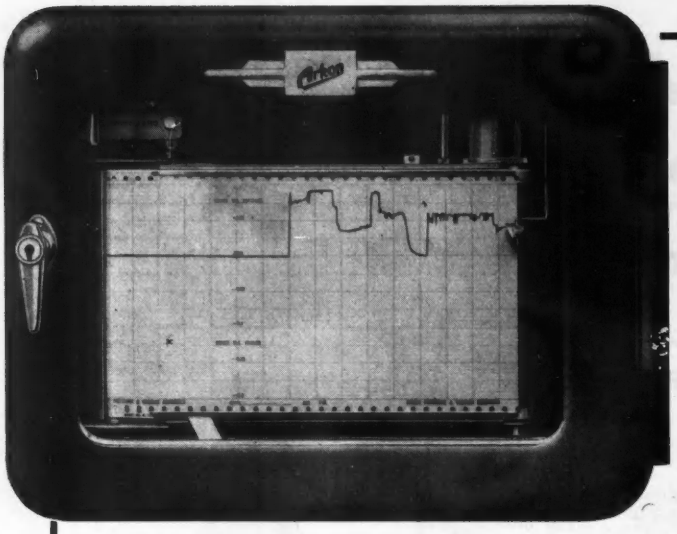

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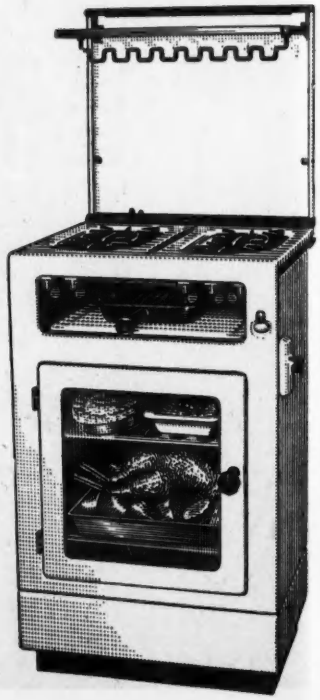

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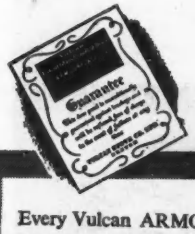

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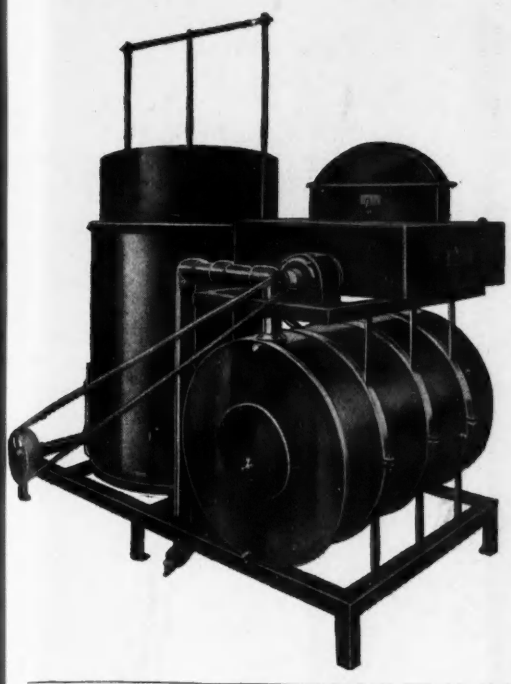

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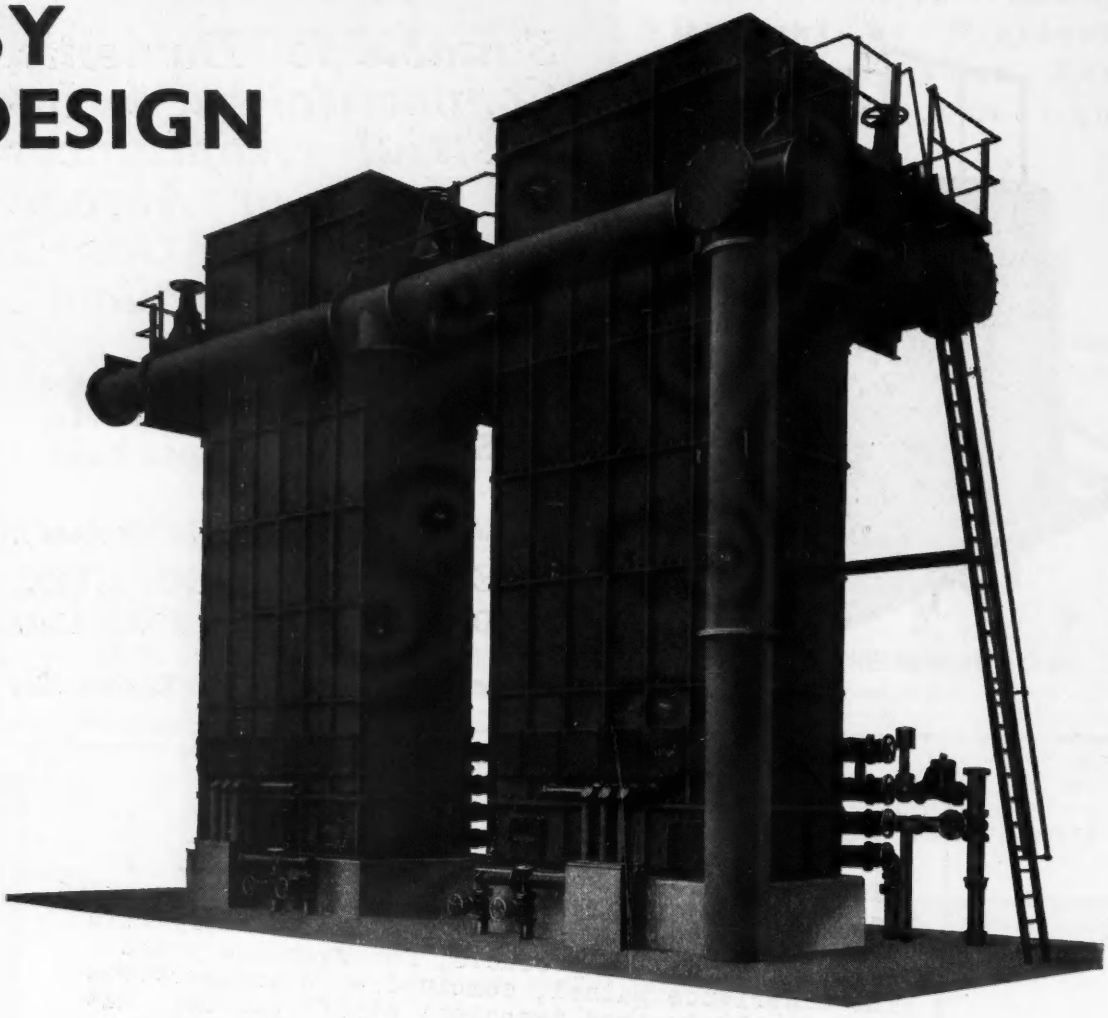

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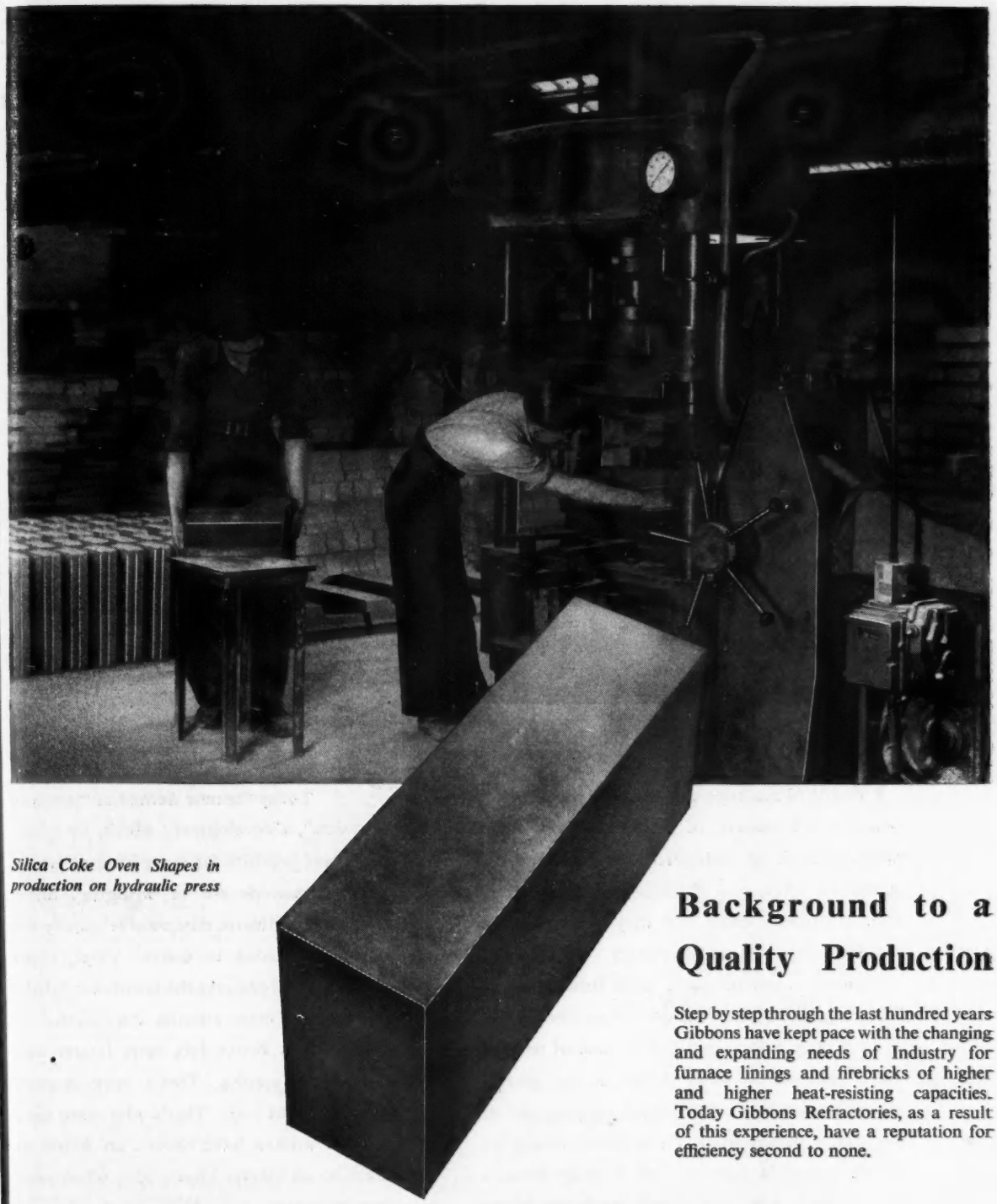

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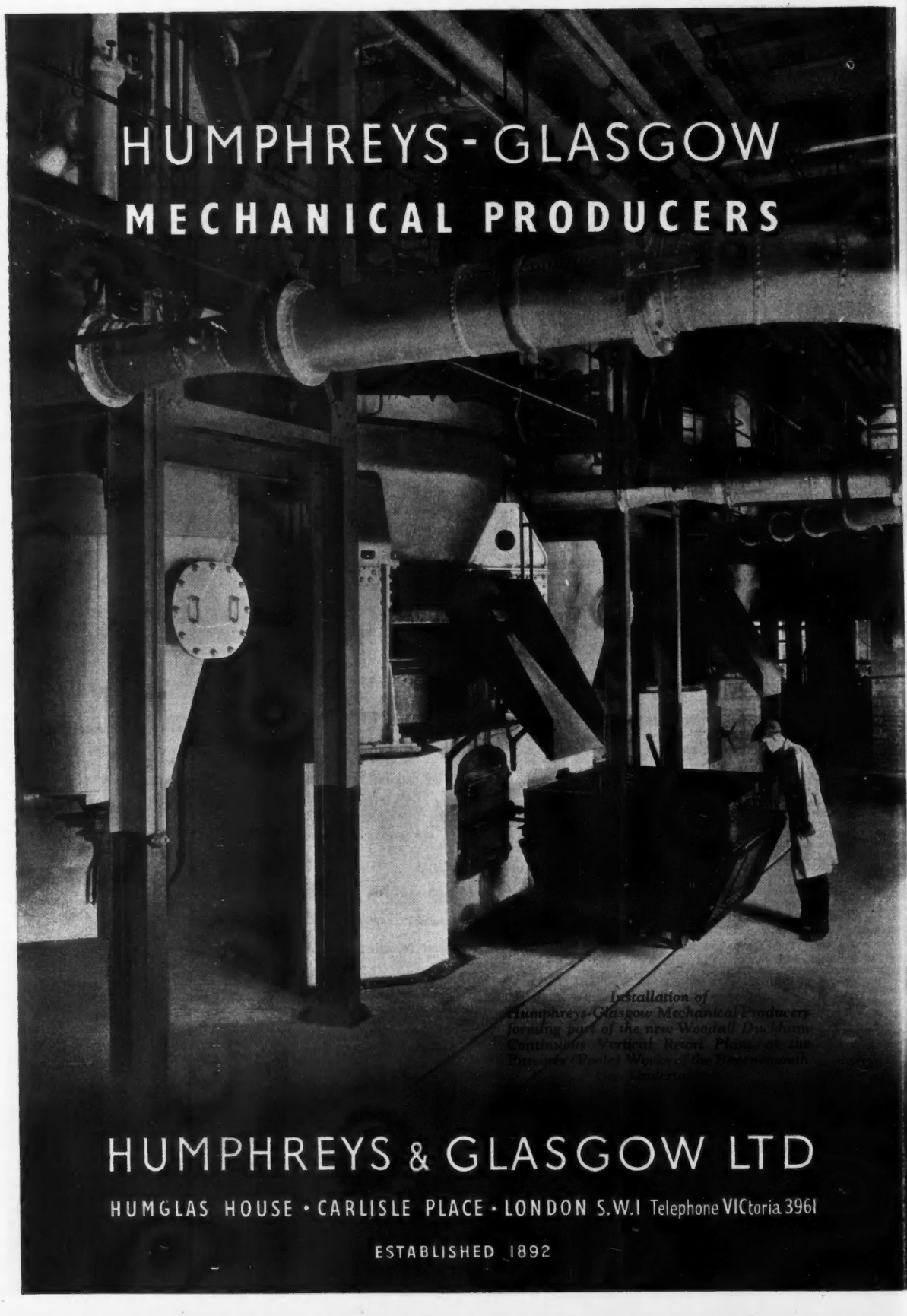
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103rd YEAR OF PUBLICATION

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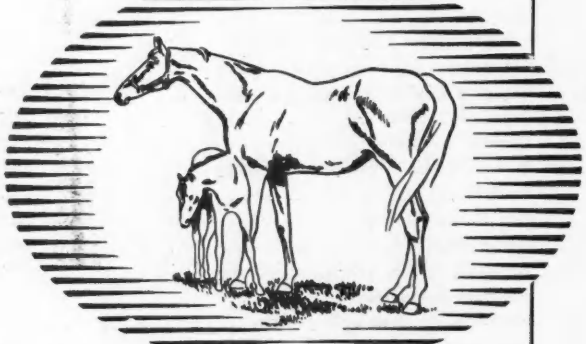

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GAS JOURNAL

VOL. 265. No. 4579 103RD YEAR MARCH 7, 1951

COAL ECONOMY IN DOMESTIC HEATING

IT is difficult to discover what national fuel policy is germinating in the collective mind of the Ministry of Fuel and Power from the answer to a Parliamentary Question which we reported last week. The relative efficiencies in the use of raw coal, coke, gas, and electricity are given in the four parallel columns; but whereas in the first case the figures are based upon the new modern closeable open fire, presumably with back boiler and flues conducting residual heat to other and upper rooms of the house, very few examples of which are actually in use, the figures for the other three cases are based upon the average use actually in being in millions of installations all over the country. Perhaps the answer is that we are seeing the beginnings of the fulfilment of Dr. Hartley's prophecy that 'After the war there will be an increased demand for coal or coke ranges which can be kept alight day in and day out.' He had already noted that whereas half the gas cookers and two-thirds of the electric cookers in domestic use are of the most modern design the majority of the solid fuel appliances are of older construction. He might have said 'much older.' In other words, whereas gas and electric cookers have reached nearly their limit of development there is much greater scope for improvement in solid fuel appliances.

We have no quarrel with the view that solid fuel should continue to be used, in the ordinary 'industrial' house, as the main source of background space and water heating. The new coal-using appliances which the Minister had in mind do much to reduce the smoke nuisance. They will not be entirely free from it. Coke should therefore be used, as it can be used, in appliances of the same type. But the case for the gas industry is based on the combined use of coke and gas. The yardstick must be coal economy. And it is to be noted that the new coal burning appliances are not suited to the production of the whole of the heat requirements of the house. There will still be needed some form of cooker, gas or electric. Hot water is required in the summer when the main fire would be oppressive and unnecessary. Some form of 'topping' or auxiliary heating is required in rooms other than the main one and perhaps the one or two bedrooms above it.

The present coal ration of some 2½ tons a year is not generally supplying the gross household requirements. How many useful therms does this really represent? Mr. Oliver Lyle finds it difficult to believe that even 20% is achieved in the domestic use of coal; on the whole he puts it at 15%. At this rate today's ration represents something like 112.5 useful therms. C. A. Masterman and others have shown that combinations of coke and gas could supply 275 useful therms per annum for an expenditure of 3¼ tons of coal. So that the useful therms now being released from raw coal in the average house could be supplied for the expenditure of 1.53 tons of coal per annum by way of coke and gas.

Until recently these figures were being worked out on the basis of what the consumer could afford in money. It was argued that to attain the desired standard of comfort the heat requirements for the average family of three to four persons living in a house by itself were represented by 275 useful therms. The criterion was the probable money cost at which this requirement could be met by the several fuels or combinations of them. The picture has changed. Money values have, it is true, increased at roughly the same rate all round. But the hard fact is that the quantity of coal available for all needs tends to remain stationary or even to recede. This desirable standard of comfort could be reached by way of gas or coke and gas with an increased coal consumption of something like 12%. It would mean a vast extension of gas-making plant. We are not likely to see it in our time. We shall have to accept a decidedly lower standard of comfort.

The need of the hour is a close study of all the factors—to ascertain what standard of comfort is attainable without increasing the 50 or 60 million tons of coal now being consumed for domestic purposes either raw or in the forms of gas, coke, and electricity,

or what combination of these will give the highest number of useful therms under the same hard condition.

In the meantime we must hope that the figures given by the Lord President will be considered, with all the reservations he mentions and several others to which we have attempted to call attention. We are left with the view of the Minister that in the present circumstances it is not desirable that electricity should be used for continuous room heating. We should like to know under what circumstances it might be desirable.

LIQUID PURIFICATION

THE recent developments in the liquid process for the removal of hydrogen sulphide from coal gas described by Mr. J. J. Priestley (reported in later pages) are of very great interest. The advantages of such a process have long been evident. The saving of ground space which is usually put first is not now of so great a significance as the saving in labour and the possibility it offers of recovering sulphur in such a pure form as to enable it to compete in the market with imported Gulf sulphur, emphasised by the growing tendency in the manufacture of sulphuric acid to prefer the contact process which demands a virtually pure sulphur. The world shortage of sulphur is compelling our own industries to the recovery of sulphur from our own native sources of which coal is probably the most prolific. The labour cost of oxide purification in dry boxes is almost certain to grow indefinitely. Liquid purification is capable of producing an 85% crude sulphur which can readily be stepped up to over 99% sulphur by distillation or extraction.

The plant adopted for development by W. C. Holmes & Co., Ltd., was that installed in Manchester by Mr. Walker and his associates. It falls in the second of Mr. Priestley's categories—that in which the hydrogen sulphide is first absorbed by an alkaline solution with the formation of ammonium or sodium hydrogen sulphide which interacts with suspended ferric hydroxide with the formation of ferric sulphide which itself is oxidised by air with the release of the sulphur and the return of the ferric oxide. The first step was to install a small experimental plant. As a result of work on this plant modifications were successfully made and several full scale plants were erected and are now in full working operation. These and other features of the plant are fully described. One of the most objectionable features of the Manchester plant was the method of dealing with the sulphur-bearing sludge. Its sulphur content was high—as much as 75%—but its water content was also very high. The problem was the reduction of this moisture. We remember a very messy business of pressure filtering and steam drying. 'One of the major problems of liquid purification is the treatment of this material.' Apparently this problem has been at any rate nearly solved. Vacuum filtration, autoclaving, film drying, and finally dewatering and trough drying have been fully investigated. It appears that the last is the most successful; 'in an experimental drier the moisture content could be reduced to any desired figure.'

The new process is not free from effluent troubles, but these are present to some extent with dry oxide purification. They are bound up with sludge treatment. The dewatering treatment is more trouble-free in this respect than autoclaving while the film drying process producers no liquid effluent. There are going to be some nice decisions here, but results obtained so far in work on the problem of effluent disposal promises well. Another capital decision to be taken is that between the partial removal of sulphuretted hydrogen by liquid purification, supplemented by an oxide catch box, and complete removal. The latter calls for close designing and careful operation. It has the advantage that it can be used for partial removal if convenient while plant for partial removal can never be stepped up to complete purification.

Mr. Priestley is very frank about the relative costs of liquid and dry purification. The former appears to be a little higher at present-day costs of labour and material and the price of the recovered sulphur, but, as we noted above, the first item is likely to increase. Nor is the return for recovered sulphur likely to balance the increased cost. Sulphur removal from gas is a charge on the gas-making process and will apparently remain so. At the same time it will be agreed that liquid purification is more suitable for modern industrial conditions than the dry oxide process. It remains to be seen whether in the years to come it will be overtaken by the fluidisation processes adumbrated in last year's Research Transactions.

SPRING FEVER

THE Ideal Home Exhibition is with us again. As usual its sponsors have spared no effort to produce a spectacle even more impressive than in previous years, and visitors are rewarded with such marvels as the Crystal Palace as it appeared in 1851—more or less. Reluctantly, however, we must ignore these wonders and concentrate on the efforts made by our own industry to retain the public's interest in gas and make new converts. This year the Gas Pavilion has swerved from the course it has taken in the last three shows.

True, it has a theme, and a good one too, but it does not adhere so laboriously to a story as hitherto. In 1948 we had the 'Seven Ages of Woman'—and how unhappy they looked! In 1949 we were given a little experiment in fantasy called 'Alice in Thermland,' which achieved the desired amount of publicity, but, we suspect, at the expense of the essential gas message. And last year 'Treasure Island' brought us still nearer to the waxworks with a display which hardly did justice to the work entailed in its preparation.

'Spring is in the Air,' the title of the new display strikes a pleasantly optimistic note; it smacks of sunshine, lambs, daffodils, and spring-cleaning. And the Gas Pavilion has a genuinely spring-like air about it. This time there are no tableaux intended to serve as a main focal point, but there are some nice little creative touches which serve as a complement to each section

Instead of placing the accent on some purely extraneous subject, attention is focused on the appliances themselves, which is as it should be. And although one of the tenets most frequently preached (though seldom practised) in the gas industry is that masses of appliances should be avoided in displays, we endorse the decision of the sponsors to show as wide a range of equipment as possible. There are, in fact, some 80 appliances on show, and the ability of the public to tinker with them will do more good than the most novel presentation imaginable.

Gas is well represented elsewhere in the exhibition, and here particular mention must be made of the show houses. It is surely no exaggeration to suggest that these constitute the largest attraction of the show, although only the most patient are able to see them all. The choice of fuel in such houses makes a considerable impression on visitors, particularly as this year most of the houses have been furnished and fitted to the specifications of *Daily Mail* feature writers. The fact that gas has been chosen for cooking in five out of the six houses must register with those who shuffle so doggedly through their kitchens, and gas has also been widely chosen for refrigeration and space heating; the sixth house relies on solid fuel and electricity for cooking, but it is explained that this is for a rural district where gas may be unobtainable. When it is further stated that the Ministry of Food demonstration theatre also favours gas, and that several other stands have gas equipment in use, it must be conceded that Mr. Therm is well to the fore.

Curiously enough, the electrical industry contrasts with the gas pavilion by featuring a 'stunt' exhibit with the accent on novelty. It ties up neatly with the 1851 Crystal Palace spectacle by showing rooms of various periods from that date, but with modern appliances. It all leans heavily on the captions, which although amusing and informative are liable to be overlooked by the impatient visitor. There are masses of good period furniture and accessories, lads and lassies in period dress, and an inspired impression of an electric iron by Warner Cooke. But it looks a little bit involved and obscure—and awfully expensive. To our mind it all adds up to this: A stand can be of brilliant design *technically*, but in practice be less functional than a simpler effort. It is on this that the gas stand is likely to score, although only time will tell how much publicity our competitors will achieve.

DEARER ELECTRICITY

CHARGES for bulk supplies of electricity to the area electricity boards are to be increased by the British Electricity Authority on April 1. On that date a revised tariff will come into force which is estimated to increase the cost of bulk supplies by about 2%, although the effect on individual boards will vary. This new increase is exclusive of the effect of the recent rise in the price of coal. The tariff incorporates a fixed charge per kilowatt of maximum demand and a running charge per unit consumed. It will apply to all area boards, subject to regional fuel cost adjustments. The kilowatt demand has been raised by 7s. 6d. per kilowatt to £4 2s. 6d., and the running charge reduced from 0.335d. to 0.33d. a unit. The raising of the kilowatt demand charge is partly due to rising capital charges on new plant and equipment and other increased costs, and the decision of the Authority to build up its statutory central reserve fund out of its own revenues instead of relying on contributions from the area boards. A change in the basis of assessment was foreshadowed in the annual report of the B.E.A. The individual area boards will have to decide for themselves how they are going to meet the overall increase; a number of them will probably have to raise their prices to consumers. The fuel clause in existing tariffs allows for the increased price of coal, which does not affect the new tariffs.

ATOMIC ENERGY FOR INDUSTRY

WRITING under this title, Sir Henry Tizard has contributed a salutary and important article to the *Sunday Times*. In the course of this article the author points out that the economic value of atomic energy will depend on whether it can provide, in certain places and in certain circumstances, needed sources of power which cannot be more easily or more cheaply provided by existing methods. 'I cannot yet see,' he says, 'the slightest evidence that atomic energy can replace coal as the basis of material civilisation, or that the use of atomic energy for the production of power can significantly raise the standard of living of any nation, within the lifetime of any living person.' And again, 'even if the cost of producing electricity from atomic energy turns out to be less than the cost of production from coal, it will make very little difference to the economic strength of the country. Its real value may well be to provide an insurance against future inability to raise enough coal for the needs of the nation. It may then be better to import fuel in the form of uranium ores than in any other form. But when that time comes to stay this country will certainly not be able to support its present population.' It is not that Sir Henry Tizard questions in the slightest the need for research of the highest order on the subject of atomic energy from all aspects. He believes that the indirect effects of the research on other branches of engineering and industry will be great. The object of his article was to put the matter into perspective, and he asks that we should not delude ourselves into thinking that the use of atomic energy for the production of power on land or the propulsion of ships at sea is going to be of any real economic importance for a long, long, time.

THANK YOU, TORQUAY!

THERE is no question that the industry's integration schemes have captured the interest of the general public. This is all to the good for it is valuable publicity and also helps to counteract a certain amount of unreasoning antagonism which exists among sections of the community against a nationalised industry just because it is nationalised. A recent case in point comes from Torquay where at a Board lunch attended by the Mayor and Deputy Mayor, Mr. C. H. Chester, Chairman of the South Western Gas Board, mentioned plans aimed at integrating over a hundred works in the area.

This occasion received an excellent 'press'—not only in the form of a very full report of the speeches and an accompanying photograph, but also in the editorial column of the local newspaper. The writer, having first made it quite clear that he had no love for nationalised industries, proceeded to pay ungrudging tribute to the gas industry, *despite the fact that it is nationalised*. (The italics are

his.) Long before nationalisation, he went on, the gas industry in that neighbourhood was brilliantly run and was tremendously successful. It was a success before the Government laid hands on it, and it continues to be a success. There is no need for us to suggest that what this writer said about Torquay applies to 99% of the industry throughout the land.

'The success of the gas industry' (we continue to quote) 'is due not to nationalisation but to the fact that skilled men who have built the industry are left to do their job without interference. As long as that condition of affairs continues we are not likely to have undue anxiety about gas. . . It is when votes begin to matter that things go wrong. When that happens business flies out of the window and even a prosperous affair can be made a tragic failure. . . Meanwhile gas is doing pretty well. So is electricity, but let the politicians start messing about and we shall face the same colossal losses we have seen elsewhere.'

The industry is grateful for comment such as this, which, with the report of the Board function, provided publicity deserving of a wider readership.

Personal

Mr. Percy E. Kirkman has retired from his position as Regional Fuel Engineer for the North Western area of the Ministry of Fuel and Power. He began in 1905 as Fuel efficiency consultant to the Calico Printers' Association and produced the first plant for testing fuel on a commercial scale. He served as Chairman of the North Western Fuel Efficiency Committee for six years. His successor as Fuel Engineer is **Mr. J. O. Henly.**

◆ ◆ ◆

Mr. Arthur W. Goode, who has represented C. R. Averill, Ltd., of 22, Duchy Street, London, S.E.1, in the Birmingham and Midland District since 1926, has been appointed Sales Manager of the firm. Mr. Goode commenced his new duties in London on February 26. **Mr. J. C. Mason,** who has represented the firm in Wales and south-west territory for the past year, will take over Mr. Goode's old territory with headquarters in Birmingham.

Alderman Mrs. Rose Hodson, Deputy Chairman of the East Midlands Gas Consultative Council, has been chosen to be the next Mayor of Doncaster. She will be the first woman Mayor of the borough and her daughter-in-law, Mrs. Muriel Hodson, will probably act as Mayoress.

1951 'Journal' Directory

THE following changes have been notified during the past month. To keep the information in the 1951 edition of the *Gas Journal Calendar and Directory* up to date readers are invited to note these alterations (together with the appropriate adjustments relating thereto in the 'Personnel' section, pp. 137-152):

Page 21.—EAST MIDLANDS GAS CONSULTATIVE COUNCIL: Add J. Smithson (Woodall Spa) *member.*

„ 21.—EASTERN GAS CONSULTATIVE COUNCIL: Add Councillor Lieut.-Col. R. I. Musson (Whetstone) and Councillor M. F. Jennings (Saxmundham) *members.*

„ 22.—SOUTH EASTERN GAS CONSULTATIVE COUNCIL: Add Councillor Mrs. M. Jenkins (Beulah Hill) and Mrs. H. S. Mair (Seaford) *members.* Delete Alderman H. Burden (Hastings), *member* (resigned).

„ 81.—HAYWARDS HEATH: Delete S. H. Cox, *M* (deceased).

„ 111.—WEST MIDLANDS GAS BOARD: Dr. J. Gregory, M.B., C.H.B., D.I.H., *Assistant Medical Officer*; P. C. Billings, A.C.A., *Senior Accountant.* Delete J. H. Wainwright, *Industrial Relations Officer.*

„ 114.—KIDDERMINSTER: J. H. Wainwright, *E & M.*

„ 158.—PORTADOWN: Now owned by Portadown Borough Council.

„ 176.—GAS RESEARCH BOARD: *Members of Council:* Delete E. V. Evans; add J. H. Dyde, M.SC., and G. E. Currier, O.B.E.

„ 177.—WOMEN'S GAS COUNCIL: Now changed to Women's Gas Federation.

„ A1.—ADVERTISERS' DIRECTORY: Armco, Ltd., 72, Grosvenor Street, London, W.1. T/A Armcoingot, Wesdo, London; T/N Mayfair 4756-7-8.

Diary

Mar. 8.—Institution of Gas Engineers (Eastern Section): 'Some Notes on Coke," C. A. Deas, Coke Manager, Eastern Gas Board, 17, Grosvenor Crescent, 2.30 p.m.

Mar. 9.—London and Southern Junior Gas Association: Short Paper evening, 178, Edgware Road, 6.30 p.m.

Mar. 10.—Institution of Chemical Engineers (North Western Branch): 'The Reactivation of Bone Charcoal,' W. L. Howe, M.INST.GAS E. (Liverpool Gas Undertaking), and A. Moult, B.SC., Radiant House, Liverpool, 2.15 p.m.

Mar. 10.—Scottish Junior Gas Associations: Joint Meeting of Eastern and Western Districts, Royal Technical College, Glasgow; address by G. E. Currier, O.B.E., Junior Vice-President, Institution of Gas Engineers, 3 p.m.

Mar. 14.—Yorkshire Junior Gas Association: President's Day, Sheffield.

Mar. 14.—Institution of Gas Engineers (South Western Section): 'Intermittent Vertical Chambers at Weston-super-Mare,' W. J. Baker; visit to Weston-super-Mare works.

Mar. 14.—London and Southern Junior Gas Association: Visits to works of Hoover, Ltd., and J. Lyons and Co., Greenford, 2.30 p.m.

Mar. 15.—Combustion Engineering Association: Annual Dinner and Dance, Dorchester Hotel, 7 p.m.

Mar. 15.—Gas Council Commercial Managers' Committee: Gas Industry House. 10.15 a.m.

Mar. 17.—London and Southern Junior Gas Association: Visit to Rockware Glass Syndicate, Greenford, 2.30 p.m.

Mar. 17.—Manchester District Junior Association of Gas Engineers: Annual Dinner at Manchester; address by F. M. Birks, President of the Institution of Gas Engineers.

Mar. 17.—Wales and Monmouthshire Junior Gas Association and Western Junior Gas Association: Joint Meeting at Cardiff. Paper by A. D. Mason (Wales Gas Board).

Mar. 19.—Eastern Gas Consultative Council: Connaught Rooms, 2 p.m.

Mar. 20.—Midland Junior Gas Association: 'Organisation and Opportunities in New Building Development,' R. Kimble (Birmingham), Staff Mess Room, West Midlands Gas Board, Birmingham.

Mar. 21.—Institute of Fuel: 'Gas and Coke Production; Present Status and Trends,' F. S. Townend; the University, Sheffield, 6.30 p.m.

Mar. 27.—Institution of Gas Engineers (London and Southern Section): 'Some Notes on Estimating the Gas Demand,' W. A. Evetts, Divisional Engineer, Watford Division, Eastern Gas Board; 17, Grosvenor Crescent, 2.30 p.m.

These exclusive sketches were drawn by the famous caricaturist 'Mel' at Gas Industry House last Friday on the occasion of the Gas Council's pre-view of the Gas Pavilion being staged at the Ideal Home Exhibition, Olympia (editorial comment p. 600).

South Western Expansion Scheme

INTEGRATING A HUNDRED WORKS

SPEAKING at a Board lunch held at the Hydro Hotel, Torquay, on February 23, the Chairman, Mr. C. H. Chester, C.B.E., said that the Board was planning extensions aimed at integrating over a hundred gasworks within the area of the South Western Gas Board.

Among those present were Mr. E. R. V. Porter (Deputy Chairman of the Board), Mr. G. H. L. Easterbrook (Member), Mr. W. N. Curtis (Secretary and Solicitor), Mr. R. C. Taylor (General Manager, Southern Division), and Mr. J. Carr (General Manager, Northern Division). The guests included the Mayor of Torquay (Ald. T. F. Adams) and the Deputy Mayor (Major W. J. Brockman).

Mr. Chester expressed appreciation of the presence of the Mayor who, he said, symbolised the *camaraderie* of Torquay which he had known for 20 years. He was pleased, he said, to have such an excellent team in the gas industry. There had been no disturbances among their 10,000 employees. The general managers in the north and south divisions of the area and their executives were doing good work. He was grateful to them.

Their increases in the second year of operations were equal to the total output of one of the 11 sub-divisions in the area. They had had to be adepts at improvisation. Gas never failed.

The maintenance of personal good feeling in the undertaking made for happiness. With the satisfaction of the consumer and the happiness of those employed in the service, the industry would pay its way.

They were saving a quarter-of-a-million pounds by increased efficiency, and he was very proud that they had achieved that target.

There was a competitive spirit in the area, and it was on a friendly basis. That was the spirit he desired to engender.

Mayor's Tribute

The Mayor said it had always been considered that the Torquay and Paignton gas undertaking was one of the finest in the country. He understood the gas industry was but little disturbed or interfered with by the higher authorities in Parliament, and he believed this accounted for a great deal of their success. It was realised that on the Gas Board were practical business men with understanding and technical ability. They knew their job.

He could speak with knowledge of the gas undertaking at Torquay, and it was pleasing to know that it still had the services of Mr. R. C. Taylor, a man of outstanding ability who now had charge of the Board's Southern Division.

Mr. Easterbrook, whose family had been in the gas undertaking for many generations, must be an asset to the Board. All had proved their worth and ability and higher authorities realised that the industry could be run only by men of practical experience.

Declaring that the gas industry gave excellent service, he said his own experience was that when he asked the gas undertaking for information, it was given on the spot. There was, too, the fact that they received from the gas undertaking civility which they got in few industries.

The undertaking had effected immense savings and was running more or less as a public company which in no small way contributed to the success achieved. If other nationalised industries could be run on the same lines, success would be assured. The incentives and the friendly competition which had been instituted helped towards success.

The Chairman of the South Western Gas Board describing the Board's integration development to the Mayor of Torquay, the Deputy Mayor, and Mr. G. H. L. Easterbrook.

Mayoral Occasion.—Three officials of the South Eastern Gas Board, all Mayors, were present at a recent mayoral reception at the Kingston-on-Thames Guildhall. They were Councillor C. L. Sinclair (Mayor of Kingston), Alderman J. B. Green (Mayor of Malden and Coombe), and Alderman R. J. S. Croft (Mayor of Eastbourne).

Making Money?—Protesting against the recent increase in the price of coke, a Kirkcaldy consumer says this raises the Scottish Gas Board's profit on a ton of coal to £2 2s. 8d., and that the Board is taking an unfair advantage by selling coke at the new price to a coal-starved public. A ton of coal which costs the Gas Board £3 4s., yields 10 cwt. of coke (£1 6s. 8d. at the new price) and 15,000 cu.ft. of gas at 5s. 4d. per 1,000 cu.ft. (£4). 'That,' she says, 'is without counting the value of tar and other chemicals also extracted from the coal.' The figures, she says, were worked out by her husband, a Fife miner.

A Cookery Demonstration, the first for a great number of years, was arranged by the Southern Gas Board recently in the British Legion Hall, Alresford, Hants. Being something new to many of the townsfolk, the demonstration created a considerable amount of interest, and there was a general wish for further demonstrations of the same kind in the near future.

Gas Cookers Wanted.—A request by tenants of houses at Oakley for additional cooking facilities was brought to the notice of Fife Finance Committee at a meeting at Cupar. It was stated that, at present, the tenants have to do their cooking on grates. Mr. David Hunter (Oakley) told the Committee that 50 out of 60 tenants wanted gas cookers installed, seven wanted electric cookers, while three had installed their own. 'I think it is only right that gas cookers should be installed,' he said. 'The majority want gas and these are the only houses in the scheme which have not good cooking facilities.' The Committee agreed that the County Clerk should ascertain the estimated cost of installing either electric or gas cookers.

RECOGNITION OF LONG SERVICE

A SCHEME for recognition of long service has been introduced by the West Midlands Gas Board. Under the terms of the scheme employees will become eligible for awards on the basis of an award costing the Board not more than £10 for 25 years' service; £25 for 40 years' service, and £50 for 50 years' service. Recipients must have been in the service of the Board on January 1, 1951, and the completion of 40 years' service at December 31, 1950, will not entitle the employee to receive a 25-year award in addition to the 40-year award. Qualifying service must have been continuous and with one or more undertakings vested in the Board.

If a recipient desires to purchase an article at a price exceeding the amount allowed, he will be permitted to do so on payment of the difference. If, however, the cost is less than the amount allowed, a cash adjustment cannot be made. Awards must be selected from an approved list of articles, and it is also proposed to present an engrossed Certificate of Service on retirement.

In view of the large number of employees who will have qualified on the introduction of the scheme, the Board has decided to spread the awards in 1951 as follows:—

Years of service.	Awards to be made in 1951.
40 or over	By March 31
35—40	April to June
30—35	July to September
25—30	October to December

It is proposed on the first occasion that presentations to those with over 40 years' service shall be made, where practicable, by a member of the Board at specially arranged divisional meetings. Subsequent presentations will normally be made by Divisional Managers.

City & Guilds of London Institute

The report of the Council of the City and Guilds of London Institute for the year ended December 31, 1949, presents an interesting survey of the activities and developments during the year, including the changing personalities, the illuminating statistics of student and candidate numbers and the hard irrefutable facts of the financial position. For reasons of economy detailed tables and lists of the results, etc., in the respective departments have not been included as in pre-war years. Any member requiring further detailed particulars is invited to apply to the Secretary, Gresham College, Basinghall Street, London, E.C.2.

The increased activities and additional developments noted in previous years continued in 1949. In particular, the total number of candidates taking the examinations in the Department of Technology rose from 58,639 in 1948 to 69,253 in 1949. The number of candidates in the Gas Fitting examinations at 1,411 showed an increase of 246 over the previous year. There is every reason to expect that this rate of increase will be maintained for the next three or four years.

The great expansion of the work of the Institute and the increasing calls on its organisation are sure signs that the foundations of the Institute were wisely planned so that its growth has proceeded both naturally and efficiently.

The independent nature of the control and financing of the Institute is perhaps not widely known or understood, even by some of the members. It must be emphasised that the Institute receives no grants from public funds, although it works in the closest co-operation with the Ministry of Education, the Local Education Authorities, and professional and industrial organisations. The whole of the funds necessary to bridge the gap between students' and candidates' fees on the one hand, and the cost of running the Institute on the other, are provided by subscriptions from the City Corporation and the City Livery Companies, and it is their representatives who control the finance and administer the affairs of the Institute.

208 Years' Service

The latest issue of the *Segas Journal* (South Eastern Gas Board) gives details of a fine record of service to the gas industry by the Downes family, of Guildford.

The first Mr. Jack Downes joined the Guildford Company shortly after 1860. He was still working in 1912, which gives him at least 52 years' service.

His son, also Mr. Jack Downes, started work as a lamp cleaner in 1883, at the age of 12, and worked his way up to works foreman, which position he held for 50 years. He retired in 1944, with 60 years' service, bringing the family record to 112.

On his retirement his place as works foreman was taken by his son, yet another Jack, who, up to date, has served for 36 years.

The total for the three generations is, therefore, the formidable one of 148 years. In addition, Mr. Jim Downes, uncle of the present foreman, can add another 60 years to the family's score.

London and Southern Section—I.G.E.

The new officers of the London and Southern Section of the Institution of Gas Engineers for the next session were announced by the Chairman (Mr. T. C. Battersby) at a meeting on Tuesday of last week.

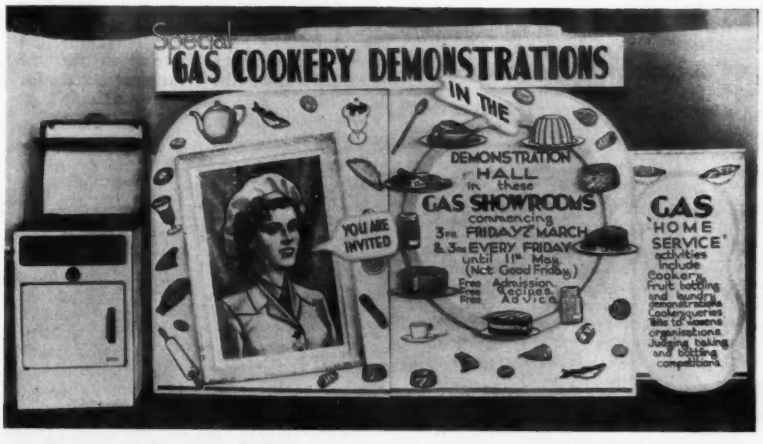
The Chairman will be Dr. A. E. Haffner; the Senior Vice-Chairman, Mr. C. R. M. Croft; Junior Vice-Chairman, Dr. J. Burns; Auditors, Mr. C. F. Botley and Mr. H. A. Probin; District Member of the Council of the Institution of Gas Engineers, Dr. S. Pexton; Hon. Secretary and Treasurer, Mr. A. F. Grant.

In announcing with regret the impending resignation of the present Hon. Secretary and Treasurer, the Chairman referred to Mr. J. M. Webber's valuable work for the former Southern Association, the former Eastern District, and the new District Section. He had been a tower of strength to many past-presidents, and Mr. Battersby had enjoyed having him at his right hand. Mr. Webber had agreed to carry on for the remainder of the present session with the assistance of Mr. Grant. The latter, said the Chairman, would be welcomed by the members, and would no doubt maintain the same high standard set by his predecessor.

A paper entitled 'Research' was presented at this meeting by Dr. J. G. King, O.B.E., D.SC., PH.D., Director of the Gas Research Board, which will be published in a subsequent issue of the *Journal*.

The Purchasing Officers Association have published three more booklets in their 'Raw Material Survey' series. These are *Coal*, by T. A. Eagles; *Non-Ferrous Metals*, by H. H. C. Wood; and *Manufactured Abrasives and Industrial Diamonds*, by various authors. The booklets are numbered 4, 5, and 6 in the series and are available at the Association's Offices, Wardrobe Court, 146a, Queen Victoria Street, London E.C.4.

HOME SERVICE DISPLAY AT COVENTRY



This striking window display was specially prepared by the display department of the Coventry undertaking to link up with cookery demonstrations organised by the Home Service Section.

TRADE NEWS

George Cohen, Sons, & Co., Ltd.

We were recently invited by the Directors of George Cohen, Sons & Co., Ltd., and K. & L. Steelfounders & Engineers, Ltd., to witness the first demonstration of the new Jones KL 66 mobile crane at Coborn Works, Letchworth. The guests were first of all taken in parties round the works and later on witnessed a most interesting demonstration of this new crane. In addition to loads and grabs, its absolute precision was tested, along with other demonstrations, by the lowering of a six ton load on to egg and cracking the shell without breaking the egg. A load of one ton was used for dealing gently with a three layer Easter egg, each layer of which was cracked separately. The demonstrations indicated the perfection and mechanical accuracy reached in the control equipment. Afterwards, the guests were entertained at a buffet lunch, where Mr. F. W. Rowe, the Managing Director, made a short speech elaborating what had already been shown.

While high speeds are required for duties such as grabbing and magnet operation, the handling of fragile merchandise and the accurate placing of masonry and structural members in building and civil engineering demand great sensitivity of control. The KL 66 is designed to satisfy both extremes of duty with equal efficiency. .

The controls of the crane are simple and foolproof in operation and are so placed as to avoid fatigue to the driver. As on a lorry, there are only three foot pedals (for engine-clutch, travelling brake, and engine speed respectively), so that a man who can drive a lorry is at once at home with these controls. Steering is by a large diameter steering wheel, set at the optimum angle for easy manipulation, and when the superstructure is slewed to the rear of the crane steering is automatically reversed to normal action—which is very important from a safety point of view. The levers are light in operation and are placed conveniently to hand so that any chance of confusion is avoided.

The crane is of the full-circle slewing type and, in common with the existing range of Jones KL mobile cranes, uses the direct mechanical transmission system with Diesel prime mover. The four motions of hoisting, slewing, travelling, and derricking are independently operated and reversible. A new feature is the application of unit construction to the various crane motions. Each motion—*e.g.*, hoisting, slewing, derricking, and travelling—has its own gearbox with enclosed bearings and gears with oilbath lubrication. Practically all bearings are of the ball or roller type, and these, together with the self-lubricating bearings, that are liberally used, reduce periodic maintenance to a minimum. The maximum load of six tons can be hoisted at speeds up to 40 ft. per min., but lighter loads up to two tons can be handled at 120 ft. per min., enabling high outputs to be attained when the crane is used for grabbing. For accurate placing of loads, an inching movement is provided, either for lifting or lowering.

Gradients up to 1 in 8 can be negotiated by the machine travelling light; and a full load of six tons can be carried on level ground at speeds up to three miles an hour. Without loads, on level ground, the crane can travel at six miles an hour and can turn in a circle of 23 ft. radius. The standard power unit is a Perkins diesel engine of 37 B.H.P. Electric self-starting is fitted as standard equipment and thermostatic control of the cooling system keeps the engine at the correct running temperature whatever the climatic conditions.

The Jones KL 66 can be supplied as a mobile crane on pneumatic tyred restrictor wheels or on crawler chassis. It is also available as a lorry mounted crane, or on railway chassis. If required, it can be supplied on a fixed base suitable for mounting on a platform or wharf. The general dimensions of the crane are as follows: Overall width, 8 ft.; overall height with jib lowered, 11 ft. 4 in.; tail radius, 6 ft. 3 in.; weight with 20 ft. standard jib, approx. 13½ tons; stability margin on level ground, not less than 50%. The maximum duty of the crane is six tons at 9 ft. radius with proportionately smaller loads at longer radii. (*George Cohen, Sons, & Co., Ltd., Cunard Works, Chase Road, London, N.W.10.*)

George Cohen, Sons, & Co., Ltd., announced a marked increase in the volume of business transacted during current financial year. Further beneficial effects of corrective action mentioned by the chairman in the statement accompanying the last report are now being felt, fully justifying maintenance of the interim ordinary dividend at 8% now declared.

British Tabulating Machine Co., Ltd.

Issue No. 73 of the *Tabulator*—a bulletin devoted to Hollerith punched card accounting—makes interesting reading for all those concerned with efficient accounting methods and the keeping of up-to-the-minute records. Among many interesting applications of this system is in the Marine Branch library of meteorological statistics where the record cards have to survive numberless tabulations over a period of many years. Another interesting application is in connection with the automatic computing engine (ACE for short) developed by the National Physical Laboratory. This is one of the machines popularly referred to as 'electronic brains,' which can perform, in a few minutes, calculations which would occupy a team of mathematicians for weeks. ACE receives its instructions and records results by means of Hollerith cards which are fed into a reproducer, modified for this application and connected to the machine. The Hollerith has also been used for many years in the Avro organisation for costing, accounting, and wages. (*The British Tabulating Machine Co., Ltd., 17, Park Lane, London, W1.*)

For the Festival

THROUGH the co-operation of Radiation Ltd., we are able to give advance details of the New World No. 3518 gas range which will be shown at the Festival of Britain Exhibition. In this range compactness, wide flexibility of usage, and convenience for cleaning have been combined with the usual high standards of New World cooker performance. An independent structural framework carries the various functional components and exclusive use is made of Radiation stain - resisting enamels.

The overall dimensions of the new range are:—Width, 36½ in.; depth (including tap and door handles) 25½ in.; height—to hotplate 36 in., to top of splash-back 44½ in.

The functional units incorporated are:

(1) Four burner hotplate supplemented by a central simmering and griddle plate unit.

(2) New World Regulo-controlled oven.

(3) Large multiple-heat grill.

(4) Independently heated low temperature cooking oven and warming chamber.

(5) Storage drawer for utensils, cereals, kitchen condiments, etc.

The flues from the enclosed compartments are built-in and vented forwards through the splash-back, enabling the range to be installed flush to the wall while avoiding high wall temperatures.

The range is fitted with gas governor and fixed injectors. All control taps except those for the main oven and grill are of special patented design incorporating a new fine-control feature. The taps are locked in the 'off' position and on being turned through 90° locate into the full-on or 'high' position (which is indicated): further turning though 180° covers a full range of cut down to an adjustable pre-set minimum rate. Great flexibility in heating is thereby ensured.

Details of the functional units are as follows:—

Hotplate

The hotplate top (36½ in. wide x 20½ in. deep) is a one-piece pressing finished in stain-resisting white vitreous enamel with spillage bowls round each burner, and this can either be lifted off or alternatively raised from the front and supported by a hinged prop, to give unrestricted access to the burners and crownplate. Removal of the burners leaves a completely - unobstructed enamelled crownplate.

The burners are individually mounted, of simple contour and vitreous-enamelled for easy cleaning, the boiling burners comprising each pair being spaced at 9½ in. apart to make full use of the hotplate depth. They are of non-lighting-back design, the back burners being of Rado type rated at approximately 10,000 B.Th.U./hr. and the front burners of ring type rated at approximately 12,000 B.Th.U./hr.

The pan supports are combined together in pairs in castings contoured for easy cleaning and finished in stain-resisting and heat-resisting black vitreous enamel.

The simmering and griddle plate (10 in. wide x 15 in. deep) is of die-cast aluminium alloy, ribbed on the underside for efficiency of heat transfer and uniformity of temperature. It is heated by a bar burner rated at approximately 6,000 B.Th.U./hr. The hotplate bowl feature in which the plate is mounted provides facilities for collecting and recovering surplus fat running from the plate during frying operations.

The splash-back (8½ in. high) carries a pair of louvred grilles over the discharge vents from the enclosed compartments of the range. The grilles are removable for cleaning and the splash-back unit is detachable for transport. This unit includes the upper sections of the flue ducts, which are sleeved over the lower sections attached to the range back. Radiation screens and air cooling channels are incorporated in the assembly to minimise back wall temperatures.

Oven dimensions are 16 in. high x 18 in. wide x 14 in. deep. The single back burner is rated at 11,000/12,000 B.Th.U./hr. The 9F front-reading cleanable Regulo is fitted.

Special features are the forward-opening top-latch door and a new form of flexible door sealing attached to the oven front.

Multiple-Heat Grill

This unit is placed at the top right hand side and is heated by two side burners with a total full-on rating of 18,000 B.Th.U./hr. The pressed Brander-type grill grid measures 11½ in. x 9½ in. and the toasting area is approximately 10 in. x 8 in. Fat and juices drain from the grid into the supporting pan where they are protected from overheating and smoking and are available for basting by access through an open corner of the grill grid.

The specially-designed tap controlling the grill is provided with 'high,' 'medium,' and 'low' positions giving three pre-determined rates of heat input, and this feature, combined with the provision of runners for five positions of the grid below the frets, gives a wide range of controlled heat intensity. The uses of this unit cover the wide field from high speed toast preparation through the whole range of grilling of meats and fish to the long-period broiling at low heat intensity of joints and poultry or game.

The interior of the grill chamber is vitreous-enamelled, with rounded corners and embossed side runners for easy cleaning, and the drop door provides a convenient shelf for supporting the pan during basting, turning and other manipulation of the food.

Low-Temperature Oven

This independently-heated unit which is below the grill chamber is suitable for cooking such items as stews, meringues, and milk puddings as an alternative or in addition to the main

(*Concluded on page 609.*)

Mitcham Scores Heavily

The Tooting and Mitcham Football Club are fortunate in having the most up-to-date gas-fired equipment for providing nearly 1,000 gallons of hot water for the two plunge baths in their dressing rooms. The apparatus is described in detail below.

THE Potterton Gas Division of Thomas De La Rue & Co., Ltd., were invited to make recommendations for a suitable system to supply the two plunge baths each measuring 8 ft. by 6 ft. by 3 ft. 6 in. deep. It was intimated that the intention was to fill each bath to a depth of 18 in. only, and that the water should be at normal bath temperature—*i.e.*, approximately 105°F. Filled to a depth of 18 in. each bath requires some 450 gal. of water at this temperature.

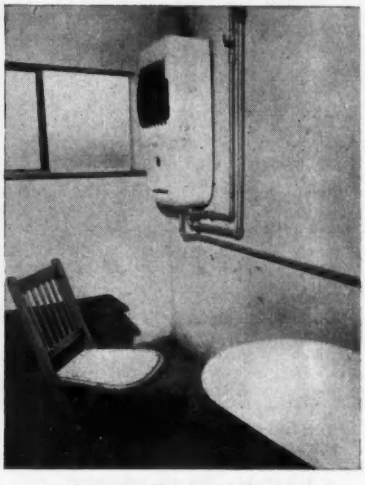
In designing the apparatus it was decided to supply the baths with hot water at 140°F. which, when mixed with the requisite amount of cold water, gave the desired final temperature.

The amount of water required for the plunge baths was calculated on the basis that a certain amount of cold water would first of all be run in by the attendant, and this was assumed to be at 40°F., which is a fair average winter temperature in the London area.

The attendant would be required to fill the bath with cold water to a depth of approximately 4 in. The remaining 14 in. depth of hot water supplied from the apparatus—viz., 315 gal. for each bath—makes a total of 630 gal. high temperature water—*i.e.*, at 140°F. These conditions result in a bulk temperature of approximately 110°F. which, although somewhat in excess of the final temperature asked for, was considered necessary to allow for the absorption of heat by the floor and walls of the baths, apart from the amount lost by evaporation and radiation off the surface of the water which have to be taken into account.

On testing the apparatus under actual working conditions it was found that with an outdoor temperature of 50°F. the attendant was able to run the water some 15 minutes before the close of play and by the time the players were ready to enter the baths the temperature of the water had dropped to 105°F.

The apparatus comprises a Potterton 'Rex' D. series boiler of six sections, giving an hourly output of 198,000 B.Th.U. with a maximum gas rate of 500 cu. ft. per hour. The storage vessel is in the form of a rectangular tank supported on special bearers with a capacity of 700 gal.

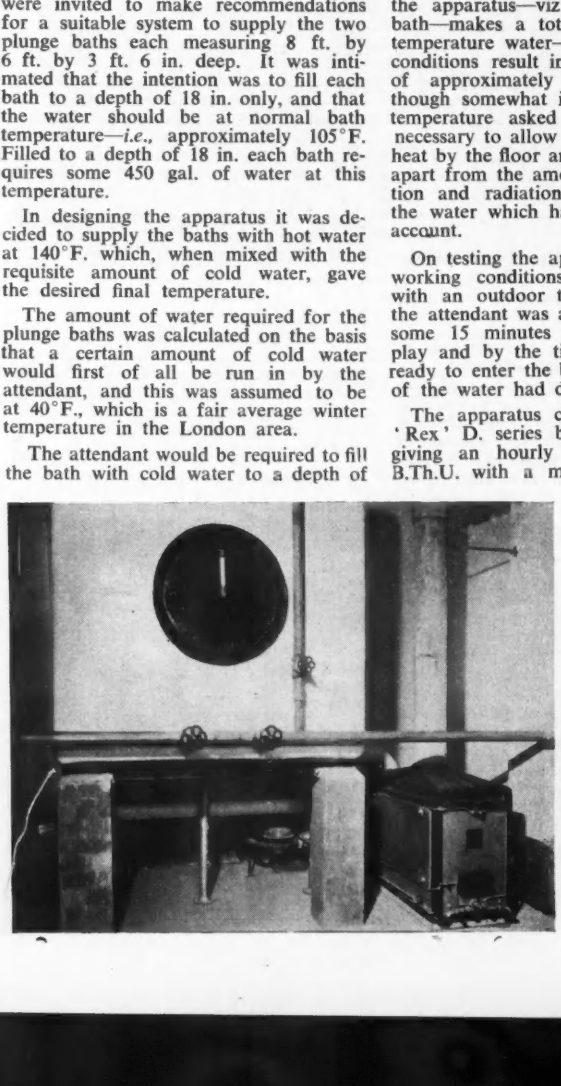


Multipoint Heater in Referee's Bathroom.

The water is heated on the bulk principle with the primary flow and return pipes entering the underside of the tank. By this method stratification is reduced to a minimum with the effect that there is a fairly uniform temperature throughout the entire contents of the tank. The draw-off pipe is taken from a position 3 in. from the bottom of the tank, and control valves are fitted to the branch draw-offs serving the two plunge baths.

The cold feed pipe enters near the bottom of the storage in a horizontal position and is fitted with a control valve.

The boiler is equipped with an immersion type thermostat operating through a relay valve and the storage tank and primary circulation are heavily insulated with asbestos composition intersected with magnesia. The time for pre-heating the storage vessel is approximately four hours.



Boiler installation for the plunge baths. This and the other two photographs on this page were taken by the GAS JOURNAL *staff photographer.*

The referee is provided with his own slipper bath, which was obviously a case for a separate unit. Hot water in this instance is provided by a De La Rue No. 175 multipoint.

Factories, Truck and Shops Acts

A supplement to the 17th edition of Redgrave's Factories, Truck, and Shops Acts has just been published with a view to keeping the original edition comprehensive and up to date.

Since the 17th edition appeared there has been further legislative activity, and some important judicial decisions have been given. The authors, John Thompson, M.A., and Harold R. Rogers, M.A., have included everything relevant or significant which appeared prior to August 1, 1950. That is the date at which they have aimed to state the law, but while the text has been going through the press they have been able in many instances to insert fresh matter.

The Shops Act, 1950, which became law on July 25 and came into operation on October 1, 1950, is a consolidating measure which revokes and re-enacts the provisions of a series of earlier Acts. Following the text of the Act comparative tables have been set out so that the reader may easily and quickly find either the antecedents of a current section or the current form of a repealed provision.

Encouraging approval has been given of the attempt, which to a limited extent was made in the 17th Edition, to extract and enunciate principles from current judicial decisions and to indicate the direction in which it appears to the authors that developments are tending.

The work is published by Butterworth and Co. (Publishers), Ltd., Bell Yard, Temple Bar, W.C.2. Price, Main Work and Supplement, 47s. 6d., by post 1s. extra. Supplement alone 10s., by post 6d. extra.

Robert Blair Fellowship

The March issue of the Institution of Gas Engineers *Bulletin* announces that applications are being invited by the London County Council for the award of one Robert Blair Fellowship in Applied Science and Technology tenable for one year. The value of the award (originally £450) is subject to variation and may amount to £850 if the country selected should be Canada or the U.S.A.

The Fellowship is for advanced study or research, and is tenable in the Dominions, the United States, or in other foreign countries. Candidates must be British subjects and at least 21 years of age. Particulars and application forms (for which a stamped, addressed foolscap envelope is necessary) may be obtained from the Education Officer (H1/2), London County Hall, S.E.1, to whom applications are returnable by March 17.

New Collier.—The Sunderland shipbuiding firm of S. P. Austin & Son, Ltd., is to build a 4,600-ton steam collier for the North Thames Gas Board.

ROYAL VISIT TO HARVEY'S WORKS

H.R.H. The Duchess of Kent expressed keen interest in the industrial conditions and the welfare of the workers when visiting the Greenwich Metal Works of G. A. Harvey & Co. (London), Ltd., recently.

After being received by Mr. Sydney Harvey (Chairman), Mr. H. T. Eatwell (Managing Director), and Mr. G. C. Harvey (Director), Her Royal Highness inspected the company's new galvanising shop, and watched the galvanising of their various products by means of the most modern equipment yet installed for this process.

Passing through the workers' canteen, adjacent to the galvanising shop, the party entered the new extension to the fusion welding shop, and here inspected typical heavy industrial plant manufactured for the petroleum and chemical industries. Among the many machine tools in which Her Royal Highness expressed interest was a portable X-ray unit.

The Duchess of Kent watches the operation of a wire spinning machine at the Greenwich works of G. A. Harvey & Co. (London), Ltd.

The Duchess then inspected the spinning shop and witnessed the spinning of a flat M.S. plate 1½ in. thick to form a dished and flanged end 8 ft. inside diameter, weighing nearly four tons, similar to that which is to be displayed in the Dome of Discovery at the Festival of Britain. This remarkable operation is carried out on a machine capable of handling M.S. plates up to 16 ft. in diameter and 4 in. thick.

From the spinning of 'Rotarprest' heads the visitors were taken through the heavy tank and construction plating shops to the steel equipment department, and here was to be seen a range of steel office and works equipment portraying the variety of products for which Harvey's are renowned. With this equipment were displayed items of office furniture which will be seen at the Festival of Britain.

Her Royal Highness then proceeded to the wire weaving department and watched the varied meshes being woven, in different metals, including steel, brass, copper, and bronze. Wire cloth ranging from 200 mesh to 2 mesh per lineal inch and wire woven to form ornamental patterns were also seen.

The last department visited was that devoted to metal perforating, and Her Royal Highness was greatly impressed with the varied operations, and watched presses of all sizes perforating sheets in copper, brass, steel, and zinc of varying thicknesses. The perforations range from round holes 0.015 in. dia. in brass sheet 28 s.w.g., to slots 1¼ in. × ⅜ in. in ⅞ in. thick M.S. plate. Of particular interest were the panels of embossed and perforated metal specially designed for the Festival of Britain.

In the course of the tour, Mr. Laimbeer (Chairman of the Shop Stewards) and Mr. Grover (Convenor of the Shop Stewards) were presented to Her Royal Highness. Before leaving the works, Mrs. Sydney Harvey, Mr. H. A. Murrin and Mr. H. E. Cooper (Directors) were presented, and Her Royal Highness had a conversation with Mrs. Sydney Harvey concerning the welfare of the employees.

FOR THE FESTIVAL — Concluded from page 607.

oven, but is also available for warming plates and dishes or keeping cooked food warm.

The dimensions of the chamber are 14½ in. high x 12 in. wide x 18 in. deep. The chamber is heated underneath the removable base by a burner rated at 6,000 B.Th.U./hr. full on. The temperature in use is variable over the approximate range 150° to 350°F. by means of one of the fine-control taps already mentioned. Two grids are provided, one being specially designed for the vertical racking of plates to be warmed.

The dimensions and position of this oven are such that a side-hinged door is the most convenient.

The drawer beneath the main oven is constructed in aluminium, measures 16½ in. wide x 18 in. deep x 5 in. high and runs smoothly on steel rollers. It provides useful dry storage space.

The Radiation gas match is fitted for the ready ignition of all burners on the range.

We are informed by Radiation Ltd., that, while it is anticipated that limited quantities of the new range will be available by the middle of this year, large scale manufacture must depend on supplies of raw material becoming more readily available. The present situation makes it essential that first preference be given to the standard type of domestic cooker.

Leeds University Graduate Honoured

A LARGE gathering of the London Branch of the Old Students' Association of the University of Leeds was present at the 31st Annual Dinner held in London on February 23, to pay particular tribute to Sir Hubert Houldsworth, K.C., himself a graduate of the University, and now holding the distinguished position of its Pro-Chancellor. The Chair was taken by Dr. H. Hollings and, as would be expected, there was a large muster of former students of the Department of Coal Gas and Fuel Industries of the University, many of whom now occupy responsible posts in the nationalised gas industry or among the contracting firms.

Dr. Hollings, in welcoming Sir Hubert, expressed delight that Lady Houldsworth had also honoured the company with her presence. He went on to thank all those old students who had travelled considerable distances, from Bournemouth, Nottingham, Leicester, and elsewhere, in order to be present on this special occasion. They were anxious, he said, to hear from Sir Hubert the plans the University had in mind for the continued extension of its premises and faculties, which had been interrupted during the war years. Several old students were rather concerned at the tremendous growth which had taken place since their day, and anxious lest the University was, in point of fact, becoming too large and departmentalised to enable the students to obtain the full benefit of improving and extending their cultural outlook by personal and social contact with students from other faculties. There was also the question as to whether the University was continuing to maintain the proper balance as between the Arts, the Sciences, and Technology, also, between teaching and research. Although, as he said, too much importance must not be given to the material amenities, Dr. Hollings did refer to the improvement and reconstruction of the staff buildings in University Road, now long overdue.

In proposing the toast of the University, Dr. Hollings said they were honoured to have Sir Hubert with them. No name could be more fitting and none could give him greater pleasure. They gladly paid homage to him as their Pro-Chancellor, and he expressed the pleasure that they all felt that this high office was filled by an old student, one whom they could all welcome as a friend, unchanged by the many well deserved successes achieved and the distinctions which had been conferred upon him.

Sir Hubert Houldsworth opened his remarks by referring to the fact that he was under an obligation to confine his speech to a chosen subject, although he would have preferred to give some of his reminiscences. He said how necessary it was that each student, on leaving College, should have, not necessarily detailed knowledge, but at least an appreciation of the fundamentals. Turning to present day affairs of the University, he said that relations between staff and students had never been better. The balance was now correctly adjusted as between the technical side and the arts. A gift had recently been made to maintain a Fellow, someone who had achieved distinction in Art, Poetry, Sculpture, etc., and who would spend eight weeks of each term available for consultation by students. A Chair in Music and a Lectureship in the Fine Arts had also been established. In regard to buildings, a licence had been granted for a new Refectory, Textile House, and Staff House.

Sir Hubert quoted figures to show the tremendous increase in running costs over the past 50 years. Sixty-five per cent. of the money was provided by the University Grants' Commission, but financial difficulties were now being faced, and it might be necessary to cut new ventures and curtail work. He hoped, therefore, that they could rely on the generosity of interested people.

Sir Hubert spoke of the great loss to the University in the death of the Chancellor, the Duke of Devonshire. He had always been prepared to help, at any inconvenience to himself, and it would not be easy to replace such an outstanding man.

Mrs. Irene Major-Stevenson, in proposing the toast of the Old Students' Association, recalled, in a most pleasing strain, the happy relationship which had existed between students and staff in the pioneer days of the years before the first World War, when the College gained its University status, and how all students were conscious of the fact, and proud of it, that it was only through their personal endeavours that the University could establish itself as one of our great national centres of learning.

Professor J. T: Whetton, President of the Old Students' Association, replying to this toast, gave an encouraging account of the development of Old Students' Branches throughout the country, and he indicated in many ways how the cultural activities of the University, despite its increase in size, were being constantly improved.

Of particular interest to students in the industry was the statement that plans had been approved for a new building for the Coal Gas and Fuel Industries and Chemical Engineering.

Reference was made to the great personal loss suffered by old students and by the University through the successive deaths within a short period of Professor J. W. Cobb and Mr. H. J. Hodsman.

PUBLICATIONS RECEIVED

The British Coke Research Association has published a report (containing discussions as well as papers) of the fourth conference of the Association, dealing with the subject of coal blending for carbonisation in coke ovens. The conference was held in the Senate House, University of London, on October 25 last.

* * *

We have received from the British Coal Utilisation Research Association a copy of the annual report for 1949, the first report of the Council since the early years of the last war. The Association was founded in 1938. During the first quinquennial period income rose from £28,000 in 1938 to £70,000 in 1942. The terms of the second quinquennial grant (1943-47) provided for considerable further expansion, and in 1947 income reached £201,500. The current quinquennial grant (1948-52) permits an increase up to £305,000 in 1952. The present annual income, excluding special Government contracts, approximates to some £210,000. Information is given concerning the Research Station at Leatherhead. A freehold site of approximately 20 acres was purchased in 1943 and a scheme of permanent buildings estimated to cost some £325,000 was subsequently approved by Council. The first building, the 'Combustion' building, was occupied in 1945. The general building position together with financial stringency compelled a revision of the original scheme and a new programme embodying, in the main, eight pairs of Ministry of Works huts, roads, etc., was started early in 1946. By midsummer 1948 most of the staff had been accommodated at the new station. The cost of the buildings to date has been £225,000. Approximately two-thirds of the necessary capital has been provided by the National Coal Board by means of mortgage debentures. In 1949 the Council approved the construction of a second large 'General Purposes' building at an estimated cost of £28,000; this will be commenced early in 1950 and will accommodate the Domestic Appliance Division, now housed in temporary laboratories at the Association's property Pebble Coombe some four miles from Leatherhead, and those services at present under temporary cover.

* * *

The Architectural Press, besides publishing the *Architectural Review*, the *Architect's Journal*, and *Specification*, publishes books on architecture and related subjects. The current book catalogue, a model of its kind, handsomely illustrated, covers a very wide field, including heating and air conditioning. It is available from the Architectural Press at 9, Queen Anne's Gate, Westminster, S.W.1.

* * *

Just published by the Institution of Gas Engineers is the new grey edition (Communication No. 369/172) of 'Gas Water Heating: The Contribution of Testing to Design,' by Mr. L. W. Andrew and Mr. C. H. Purkis. This is now available from the Secretary of the Institution at No. 17, Grosvenor Crescent, S.W.1, price 2s. 6d. per copy, post free.

Technical and Economic Aspects of

LIQUID PURIFICATION

The Author

By

JAMES J. PRIESTLEY, M.Sc., M.Inst.Gas E., A.M.I.Chem.E

(W. C. Holmes & Co., Ltd.)

The choice of a purification system for the removal of hydrogen sulphide from coal gas is discussed in this paper (Coke Oven Managers' Association : Northern Section) against a background of restricted supplies of imported Gulf sulphur and an increasing trend in the sulphuric acid industry towards use of the contact process of manufacture. The performance which would be required of a liquid purification process is given followed by a survey of the Manchester process, and its relation to other similar purification systems. Features of development of plant design are discussed in detail, both for partial and complete removal of hydrogen sulphide, with particular reference to sludge treatment, oxidation, and continuity of operation. Examples are quoted from plants in operation. Some approximate costs of liquid purification are given and the various items discussed which influence them.

THE subject of liquid purification in general has been treated in an earlier paper (1). This dealt with fundamental principles and some early experiences in the operation of pilot plant utilising the Manchester process of gas purification. Since that publication, the work has been extended and considerably more first-hand information is available. At the same time, the restriction of supplies of Gulf sulphur from the United States is causing more attention to be paid to the production and recovery of sulphur from our own native sources.

In a recent article in the *Financial Times* (2), an anonymous author drew attention to the seriousness of the home sulphur shortage. He then went on to point out that the gas industry should practise more efficient removal of sulphur from the gas, to increase our home produced supplies. Although his remarks are not applicable to the gas industry, where there is a legal enforcement of the complete removal of hydrogen sulphide, they do to a large extent apply to the coking industry, where purification is carried out to suit special needs.

It would almost appear nowadays that instead of one there are two reasons for purifying gas. Formerly the sole reason was better service to the consumer by removing the hydrogen sulphide. Now one might add the second reason, the recovery of sulphur to improve our home production. The acceptance of the second reason is of some consequence to the coking industry, where a considerable amount of gas produced is burned as a fuel in its unpurified state. It is estimated that if this sulphur were recovered it would amount to 60,000 tons per year, or about 10% of our yearly consumption.

Such a recovery could best be made by liquid purification means, rather than oxide boxes. Oxide boxes were developed in the gas industry where quantitative removal of hydrogen sulphide was essential, a condition which would not apply when purifying coke oven gas for fuel purposes. The slip of a small proportion of the hydrogen sulphide would be of no consequence. Secondly, by using liquid purification the sulphur could be recovered in a relatively pure form instead of as a spent oxide. The economic aspect of sulphur recovery in this manner will be examined later.

Speaking of the carbonising industries generally, and not just the coking section, the choice of a purification system is not governed solely by economic factors. The following have usually influenced a decision in favour of liquid purification.

(1) *Ground Space.*—A liquid purification plant occupies much less room (about one-third) of a corresponding set of purifiers. Although a rectangular site is preferred, awkwardly shaped sites may be utilised.

(2) *Labour.*—The difficulty of obtaining adequate labour for emptying and re-filling box purifiers which began during the war seems likely to continue indefinitely.

(3) *Spent Oxide Disposal.*—Although the spent oxide market may tend to brighten, considerable difficulty is often encountered in making a successful sale or in some cases a sale at all. The acid manufacturer usually states the minimum percentage (usually about 50%) of sulphur in the spent oxide he is prepared to accept, and pays for the oxide on a unit basis, the higher the percentage of sulphur the higher the rate per unit of sulphur. One of the major problems of the gas engineer, who wants the highest possible price for his spent oxide, is to achieve the highest possible sulphur content with minimum costs of oxide handling and purchase of fresh oxide.

(4) *Sulphuric Acid Manufacture.*—In addition to the three points enumerated above, are others which involve looking much further ahead. Firstly, the quantity of sulphuric acid produced in chamber plants is less than that produced by the contact process. Thorpe (3) states that but for the war, chamber plants would be redundant. In other words, the special economic conditions caused by the war have extended the life of existing plants. As far as is known, no new chamber plants are being constructed. This means that unless there is a change in the present trend, the outlet for spent oxide for acid manufacture will progressively decline because contact plants cannot utilise spent oxide as such. The installation of oxide extraction plants would have to be considered.

Restrictions on the importing of Gulf sulphur may call a halt to the tendency for a time, but it is difficult to see a permanent reversal of the process. Thorpe goes on to say that if the gas industry is to be the producer of sulphur, the present form in which the sulphur is recovered will have to be changed; it will have to be purer.

Liquid purification processes are capable of producing as a primary product, a crude sulphur containing over 85% S. By simple distillation or extraction, the quality may be improved to over 99% S. There would always be a ready

market for both these materials, the former for topping up low grade oxides in chamber acid manufacture or for refining; the latter could be used in contact acid plants.

CHOICE OF A LIQUID PROCESS

(1) Hydrogen Sulphide Removal

There are two distinct ways in which liquid purification plants may be used. Firstly, a plant may be designed solely to supplement existing box purifiers, particularly during high winter loads. In such a scheme, absorption towers would be placed before and in series with, existing boxes, no attempt being made to remove the hydrogen sulphide completely in the absorption towers. It is thought better practice to allow sufficient hydrogen sulphide to slip to keep the boxes active. It is impossible to fix on any given amount of hydrogen sulphide slip as being the optimum. In this way a liquid purification plant may be regarded in one of two ways. Operating continuously it enables additional base load to be carried without full extra capital expenditure. Alternatively, it becomes a peak load plant analogous to a carburetted water gas plant.

Secondly, a plant may be designed for the complete removal of hydrogen sulphide, replacing, not supplementing, box purifiers. This is much more difficult to achieve, and, indeed, rules out certain processes as being physically incapable of achieving the Gas Referees' Standard of purification of 1.5 parts per million or 0.09 grain per 100 cu.ft.

It should be noted that a process capable of complete removal of all the hydrogen sulphide may be used for partial removal by restricting some feature of the plant. On the other hand, a process capable of only partial removal can never be used for complete removal. Hence there is a point here in favour of the complete removal process.

(2) Sulphur Recovery

As explained in a previous paper (1) there are two large groups of liquid purification processes.

(a) Absorption-desorption, in which the hydrogen sulphide is first absorbed by a suitable solvent, and later driven out of solution along with any other absorbed gases—*e.g.*, carbon dioxide.

(b) Absorption and oxidation, in which the hydrogen sulphide is first absorbed, then oxidised to sulphur or thiosulphate or both.

The disposal of the hydrogen sulphide from the first group of processes is usually carried out by subsequent oxidation by air. Either it is sent to a Claus kiln for the production of elemental sulphur or burned and sent direct to a sulphuric acid plant. This secondary stage of oxidation tends to limit the scope of the group, which may, however, have perfectly sound local application.

No such restriction applies to the second group where the sulphur appears as elemental sulphur, oxidised in the main and not an auxiliary process. Provided the crude sulphur sludge can be handled in a satisfactory way to produce a saleable product, the oxidation group is thought to have an advantage over the absorption-desorption group.

(3) Effluents

A process having an obnoxious gaseous or liquid effluent is likely to create more problems than it solves. All the processes involving the use of an alkaline solution are likely to form a liquid effluent of thiosulphate and thiocyanate, which will add to the general effluent problem of the coke ovens or gasworks. This may be kept within bounds by careful operation. It should be noted that there is a considerable effluent from ordinary oxide box purifiers and which little note is usually taken. From figures given by Townsend (4) this amounts to 20-40 gal. per mill. cu.ft. of gas passed. The calculated O/A value is 200 p.p. 100,000 but actual experimental determinations give figures 10 times this value.

Concerning gaseous effluents, any process (such as the Seaboard) which discharges hydrogen sulphide into the atmosphere would never receive consideration in this country because of legal restrictions. Regarding the rest of the processes, an offensive smell from spent oxidation air and certain sulphur processing schemes has to be taken note of, particularly if the plant is to be placed near residential property. In practice these are rarely worse than those arising from ordinary box purifiers during the regular discharging of spent oxide.

(4) Conclusions

In the choice of any liquid purification process for general application in the carbonisation industries due cognisance must be made of the three points just elaborated. When in 1944 W. C. Holmes & Co., Ltd., were invited to become one of the licencees for the further development of the Manchester liquid purification process (5) it was recognised that this particular process satisfied these points. The process was adopted and since that time considerable development has been made. It is now proposed to consider the process in greater detail.

THE MANCHESTER PROCESS

Historical

Walker and his associates at Manchester installed an experimental liquid purification plant at the Droylesden works in 1943, and based upon the experience gained on this, constructed a full scale unit at the Rochdale Road gasworks of the (then) Manchester Corporation. This was described in detail (6). The novel claim made for this plant contrasted with previous experimental plants built in this country was that it effected complete removal of the hydrogen sulphide and did not normally rely on the use of catch boxes, except for mechanical or chemical breakdown.

A brief description of the original process is as follows. Gas was passed through a series of rectangular bays each of which was packed with wooden grids. Liquor consisting of soda flowed downwards through the bays and collected in an alkaline suspension of ferric hydroxide in ammonia and a common tank beneath. This was known as a reaction or delay tank. From here the liquor was pumped to a rectangular steel vessel known as an oxidiser, from which it overflowed by gravity to the washers, thereby completing the circuit of liquor. The oxidiser was a simple tank fitted with baffles and normally was full of liquor. Through the mass of liquor, air was blown from canvas bags situated at the bottom. Any froth was allowed to flow to the reaction tank where it was mechanically destroyed. The sequence of reactions which take place is as follows. Hydrogen sulphide is absorbed by the alkaline solution with the formation of ammonium (or sodium) hydrogen sulphide. This interacts with the suspended ferric hydroxide with the formation of ferric sulphide.

(a) (i) $H_2S + (NH_4)_2CO_3 = NH_4HCO_3 + NH_4HS$
(ii) $H_2S + NH_4HCO_3 = NH_4HS + H_2O + CO_2$

(b) $3\ NH_4HS + Fe_2O_3 = Fe_2S_3 + 3NH_4OH$

Reaction (b) takes a few minutes to go to completion; hence the provision of the reaction tank. In the oxidiser the ferric sulphide is reoxidised to ferric hydroxide, with the production of elemental sulphur.

$$2\ Fe_2S_3 + {}_3O_2 = 2\ Fe_2O_3 + 6S$$

In the original process the sulphur was separated by filtration of a portion of the circulating liquor, and although this is retained at Rochdale Road, it has not been repeated on plants of newer design save one. Many other features of the design were changed by development, which will be described later.

It will have been noted that there is a marked similarity between the Manchester process as already described, and the American Ferrox and German Gluud processes. In all three the basic principles of hydrogen sulphide removal are the same, absorption in alkali, ferric hydroxide being used as the oxygen carrier, followed by oxidation and the libera-

tion of free sulphur. The Ferrox process uses soda as the alkali, the Gluud ammonia. In the original Manchester process, ammonia was the alkali used, augmented by soda as required. Most of the recent plants employ soda only.

The main differences between the Ferrox and Gluud plants on the one hand and the Manchester on the other are two-fold:—

(a) The Manchester patent (5) includes the provision of multiple washing effects or bays, so that complete removal of hydrogen sulphide is achieved, instead of a single tower.

(b) It also includes for the provision of the reaction tank between the absorbers and oxidiser to which reference has already been made. By allowing the reaction between the alkali hydrogen sulphide and ferric oxide to be completed before oxidation, thiosulphate formation in the oxidiser by interaction of the sulphide with oxygen is reduced (7).

$$2\ NH_4HS + 4\ O = (NH_4)_2\ S_2O_3 + H_2O$$

Experimental results show that several minutes are actually required for the sulphiding of the ferric hydroxide to complete itself. In addition the reaction tank acts as a mixing vessel and balance tank for the fouled liquor.

Each absorber or effect operating under the same liquor flow takes up a different amount of hydrogen sulphide, the first one the most, the last merely removing traces. There is a strong likelihood that all the available ferric oxide will rapidly be used up in, say, the first or second towers, followed by the formation of excess free sulphide. In the latter absorbers there will be ferric hydroxide to spare. If now all the liquors are mixed, the spare ferric hydroxide is made available for the excess free sulphide from the first tower, and a uniform liquor containing no free sulphide passed on to the oxidiser.

Turning now to the comparison of the Manchester and the SMO (Staatsmijnen-Otto) processes, these are at first sight quite distinct, both of the oxidation type, the SMO process using complex iron cyanides or 'blues' as the oxygen carrier. (Included with the SMO (8) is the very similar Auto process (9)). The active blues are prepared by interaction of the hydrogen cyanide normally present in the gas and ferrous sulphate which is added to the circulating liquid. In practice it is impossible to work a 'pure' Manchester process unless hydrogen cyanide is first removed from the gas. Such pre-treatment may have advantages but has never actually been installed. Hence in normal operation of the Manchester process with its alkaline suspension of ferric hydroxide, hydrogen cyanide is quantitatively removed, as in the SMO process. Sodium or ammonium cyanide is formed first after which the complex iron cyanide or blues are formed. The oxidation and reduction of the blues is similar to that of iron oxide/sulphide. Therefore in normal operation there are invariably two oxygen carriers, blues and ferric hydroxide operating simultaneously. An exactly similar state of affairs is described by Craggs and Arnold when discussing the plant liquor on the Auto plant at Billingham (9).

Development

A considerable amount of development work was done on a small plant, capacity 0.75 mill. cu.ft./day, at the experimental station of W. C. Holmes & Co., Ltd., Huddersfield, at the works of the Mirfield unit of the North Eastern Gas Board. Several changes were made from the original Manchester designs as a result of development work at Mirfield and incorporated in subsequent plants. These include a complete removal plant operating at Liverpool (North Western Gas Board) and a partial removal plant at North Shields (Northern Gas Board) and six further plants in the course of design or construction. A plant, built by R. & J. Dempster, Ltd., is nearing completion at the Birchenwood Coal and Coke Co., Ltd. The daily capacity of existing and projected plants is 42 mill. cu.ft. of gas per day.

DESIGN

There are several features of design common to both partial and complete removal schemes, which will be introduced first. Afterwards the peculiar problems associated with each scheme will be discussed separately.

Common Features

(a) *Oxidation.*—The fundamental problem of oxidation of fouled liquor is to satisfy the oxygen demand of the reduced compounds with a minimum power expenditure. The first step is to dissolve atmospheric oxygen in the liquor. In the oxidation of ferric sulphide, experiments show that the controlling rate is the rate of solution of oxygen, but in the dual oxidation of reduced blues and ferric hydroxide, the reaction rate is reported to control (9). Nevertheless, given adequate delay time in the oxidiser—*i.e.*, more time than the reaction takes to complete itself—our concern is with dissolving oxygen. As the gas film resistance is of little consequence, bubble type oxidisers are used.

The rate of solution of oxygen is for all practical purposes directly proportional to two variables, (i) the area of the air/liquor interface and (ii) the partial pressure of the oxygen. To obtain the maximum area of interface, the air supplied is split up into bubbles as small as possible. This may be done by porous pots or sintered metallic plates, but unfortunately a practical difficulty arises. During oxidation, sulphur is precipitated in the fine pores of the medium and blocks it completely. The substitution of canvas air bags, which could be periodically deflated to crack off the sulphur, is an improvement but requires continuous attention. It was soon realised that the production of small bubbles by using small orifices —*i.e.*, a finely pored plate—was not practicable and other methods were sought. The principle was adopted of using larger orifices or slots with a high velocity relative to the liquid, which caused the bubbles to be sheared off while still small.

Rotary diffusers have been installed at Mirfield and Liverpool. Here air is blown under a hood, resembling a large bubble cap, in the sides of which are cut slots or holes. The hood is rotated and the escaping bubbles are sheared off. This is economical in power as there is no 'break through' pressure loss as with fine pored diffusers. In practice, slots have been found to be better than holes, which, even though they have a high velocity relative to the liquor, tend to become blocked with precipitated sulphur. The mechanical maintenance of the diffuser can be troublesome unless care is taken to stop accidental leakage of liquor down the shaft, causing corrosion of the bearing.

A fourth type of diffuser is in successful operation at Mirfield and North Shields. Here liquor is drawn from the oxidiser by a high capacity low head centrifugal pump and pumped through a venturi throat back to the oxidiser. The venturi throat is perforated with holes through which air is blown from a surrounding air box into the passing liquor. The air pressure in the box is maintained slightly above the static pressure in the venturi and the slugs of air pass through into the oxidiser and ascend to the surface. This type of diffuser is less difficult to maintain mechanically than the rotary type and may be more conveniently isolated for cleaning.

Turning now to the second factor influencing the rate of solution of oxygen—namely, the partial pressure—scope in this direction is limited. Air is the only practical source of oxygen, and the partial pressure can only be increased by increasing the height of the oxidiser, thereby increasing the initial air pressure. In shallow oxidisers—that is, where the air composition is almost unchanged during passage through the oxidiser—the quantity of oxygen dissolved is directly proportional to the depth of liquid. In deeper oxidisers, such as are actually used, better utilisation of the air is obtained, the average quantity of oxygen dissolved per unit of depth being greater as the depth is greater (12). However, deeper oxidisers involve higher air compression pressures, and higher costs of compression, and owing to the complexity of the actual oxidation process, the best economic height of an oxidiser is not known with any degree of certainty.

(b) *Sludge Disposal.*—In modern plants, the air which is

blown into the oxidiser performs a second function other than oxidation, the flotation of the precipitated sulphur to the surface of the liquid. Except in the original Rochdale Road plant, filtration of a bleed of liquor has been abandoned as a means of sulphur recovery. As the finely divided particles of sulphur are formed, these become attached to rising air bubbles which collect on the surface of the liquor. After a time this develops into a thick layer of froth composed of air, sulphur blues, ferric hydroxide, and liquor held up between the bubbles. Analyses show that there is always a preferential flotation of sulphur with respect to ferric hydroxide. Natural drainage will reduce the water content of the froth (or sludge as it is more commonly called) to about 70%, but rarely less. One of the major problems of liquid purification is the treatment of this material.

(i) *Vacuum Filtration.*—This reduces the water content to about 45-50% giving a material very little more use than the original. The filtrate may be returned to the plant to economise in make-up water until the concentration of soluble salts becomes too high, when a portion has to be rejected.

(ii) *Autoclaving.*—This methods is used with success on Thylox sulphur sludge but it is more difficult to operate on Manchester sludge (10). The reason for this is the interference by the ferric hydroxide in the fusion of the sulphur. Sludge is pumped into a closed vessel and heated to a temperature above the melting-point of sulphur, which sinks to the bottom and may be run off as a liquid. Thylox sulphur, having a very low solids content, behaves in this way after a 40-hour heating in a jacketted vessel. Experiments carried out on Manchester sulphur showed that if the sulphur content of the sludge, expressed on a dry basis, was over 75% (*i.e.*, 75% S, 25% ferric hydroxide tar, etc.) fusion would take place, fusion becoming more difficult as the percentage of sulphur dropped. Below 70% S fusion would not occur. Open steam heating was found to be better, as the heat transfer rate was increased, the treatment time reduced and moreover the open steam had the effect of 'sweeping' the ferric hydroxide up into the aqueous layer, improving the sulphur quality and in most cases allowing it to fuse (1). Although the process is in daily use on these lines at Mirfield the experiences at Liverpool were unsatisfactory. Alternative methods have been sought.

(iii) *Film Drying.*—In this method the crude sludge is applied in a thin film on to the surface of two steam heated steel drums revolving around a horizontal axis. Heat is transferred to the sludge from the condensing steam within the drums, evaporating the water in the sludge. The dried product is removed in thin flakes by a doctor knife set close to the drum surfaces. Experiments have shown that for successful operation, sludge feed across the drum length must be uniform.

Although the sulphur produced by film drying is impure, the process has one marked advantage to offset this, in that it disposes of the whole of the liquid effluent from the liquid purification plant. There is however, a considerable evolution of steam and vapours of an obnoxious but not dangerous type.

(iv) *Dewatering and Trough Drying.*—This relatively simple process is based on the fact that when crude sludge is heated to about 90°-100°C. a non-reversible change occurs. The change is from a thixotropic cream to a porous biscuit-like solid from which a great deal of the liquor drains away. With the expansion of contained air and of the carbon dioxide formed by the thermal decomposition of bicarbonate present, the separated (or 'dewatered') sulphur floats on the separated liquor, which can be run off. In two hours treatment from cold, crude sludge may be dewatered from 70% moisture to as low as 37% moisture, which is better than the reduction obtained by vacuum filtration. As in autoclaving, the ferric hydroxide and blues tend to stay in the aqueous layer, improving the quality of the sulphur.

Dewatered sulphur, if not saleable, is at least able to be handled mechanically. A second drying stage may be added, by treating the dewatered material in a simple steam heated trough drier of orthodox design. In an experimental drier, the moisture content could be reduced to any desired figure even to the stage of fusion of the sulphur.

(c) *Effluent Disposal.*—The accumulation of thiosulphates and thiocyanates in solution is balanced by their removal in the liquor associated with crude sludge. The rate of removal determines the normal concentration in the circulating liquor. The presence of these salts is no disadvantage to hydrogen sulphide removal; in fact the presence of thiosulphate suppresses the rate of formation of this salt (9).

Hence effluent treatment is bound up with the method adopted for sludge disposal. Film drying produces no liquid effluent. Autoclaving produces a maximum effluent similar in properties to the circulating liquor itself. Dewatering is between the two. The O/A of the effluent varies between 2,000 and 3,500 p.p. 100,000 and at 200 gal. per mill. cu.ft. gas represents about 20% of the toxic load of raw ammoniacal liquor produced from the same amount of gas.

It should be noted that the liquid purification effluent, at least on a gasworks, is not a new one but replaces the normal effluent which drains from box purifiers. Townsend (4) gives the quantity of this as between 20-40 gal. per box per mill. cu.ft. gas treated. With four boxes this is 80-160 gals. per mill. cu.ft. Unfortunately he does not state the O/A value but this must be at least 2,000 from analyses given. Actual tests on the Mirfield purifier drainage, the volume of which could not be determined, showed that this had an O/A value of 2,000 p.p. 100,000.

The choice of sludge treatment, assuming film drying and dewatering to be otherwise equally acceptable depends on the location and type of the carbonising plant. Near a residential area, film drying is best avoided unless a tall stack is available to remove the vapours. Dewatering is the better choice if the effluent may be disposed of either with the spent ammonia liquor or in coke quenching. If the effluent disposal is difficult, then film drying is the choice.

Work is at present proceeding on the treatment of purification effluents, and judging by results obtained so far, disposal will be a relatively simple operation in the future.

Special Features; Partial and Total Removal

Probably the only special problem associated with this type of plant is the limitation of the hydrogen sulphide removal to the amount required. This is best done by limiting the washer size rather than by reducing the rate of circulating liquor. Reduced irrigation encourages blockings by sulphur of the washer filling and may cause over-fouling of the liquor with the formation of ferrous sulphide (9).

(a) *Washers.*—The stringent limitation of hydrogen sulphide content laid down by the Gas Referees, of 1.5 parts per 100,000 or 0.09 grains per 100 cu.ft. calls for the highest possible efficiency of each individual gas washer or absorber. Design is complicated by the fact that with gas containing over 200 grains per 100 cu.ft., blockage of the filling gradually takes place, which requires cleaning out, say, once a year. Closely spaced board filling, while giving high extraction efficiencies, blocks more easily. Hence on a full extraction plant the washers or absorbers are divisible into two groups:

(i) Washers 1 and 2. These remove the bulk of the hydrogen sulphide and work in series. They have very open spaced filling alternatively 'disc and doughnut' filling (11) and are irrigated with twice the liquor flow of the other towers. Each may be by-passed for cleaning out, the remaining washer being able to take the bulk of the load.

(ii) Washers 3-6. These remove the remainder of the hydrogen sulphide, have close spaced filling and have half the irrigation of the first two. They are able to be by-passed in pairs. In recent designs each washer has a central division

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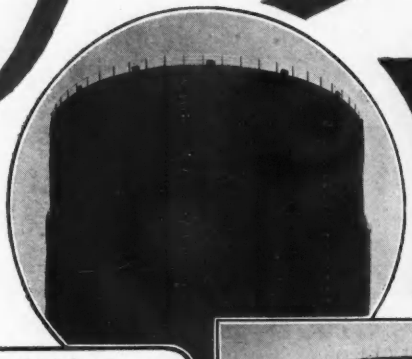

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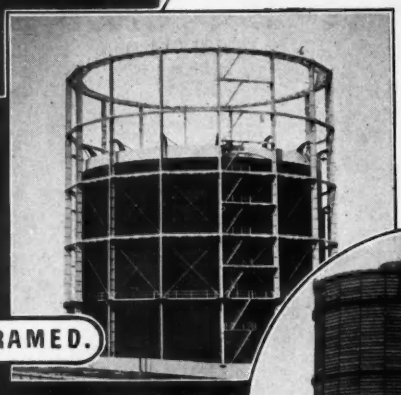

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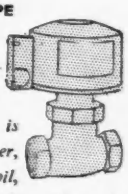

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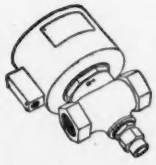

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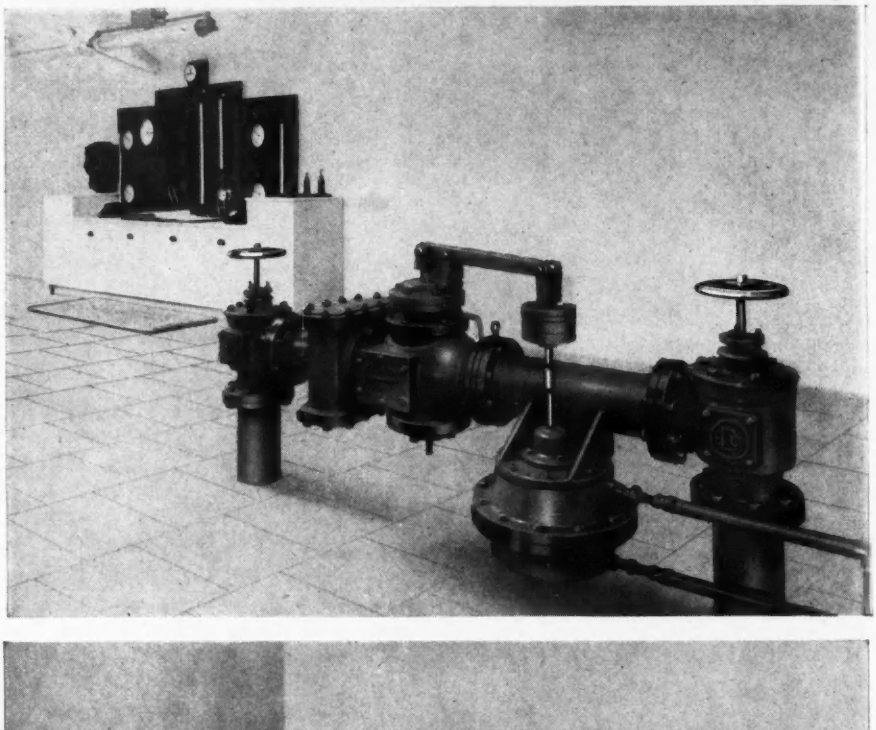

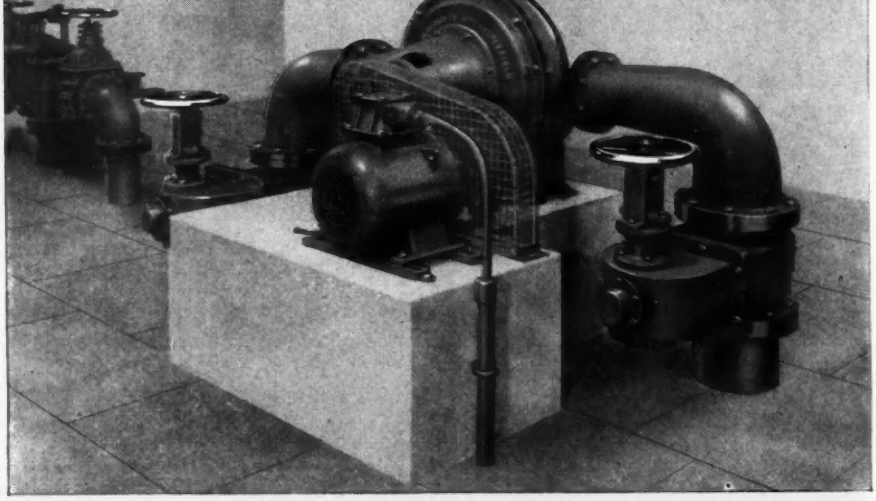

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plate, gas passing down one half and up the other, to reduce mechanical slip.

(b) *Mechanical Arrangements.*—The continuous operation of liquor pumps and air blowers on a complete removal plant must be guaranteed in all circumstances. This is especially true of pumps, because if these were to stop, hydrogen sulphide would be detected in the outlet gas in a few seconds. Air blowers may be shut off for a few minutes without harmful effects. The choice between steam and electricity for motive power for pumps and blowers depends to a great extent on the local conditions at the works where the plant is installed. The two main factors are availability of the power sources and the prevailing economic relation of the two.

Steam is usually considered more reliable. The volume of liquor to be handled demands centrifugal pumps in preference to slow moving piston types; otherwise sizes become too unwieldy. Turbine driven pumps are satisfactory, particularly if a use can be found for pass-out steam from the turbine. Reciprocating compressors are very reliable but have a high capital cost.

On existing installations electric motor drives have been installed and have proved satisfactory. The load is constant and the cost usually less than if it were taken by steam. In the event of power failure, standby equipment operated by an alternative source of power is provided. Here arrangements differ and three installations are quoted as examples.

(i) *Liverpool.*

The pumps and air blower are driven from a line shaft, at one end of which is a 120 H.P. motor, at the other a diesel engine, which takes over the drive at a predetermined speed by means of an automatic clutch. The motor is disconnected from the drive by another automatic clutch. For an emergency repair to a pump the two halves of the shaft may be disconnected, and either half stopped.

(ii) *Gloucester.*

The line shaft is replaced by individual groups of one pump each with its own motor. The blowers are to be arranged the same way. If the power fails, a no-volt switch starts up a diesel alternator which feeds power to the working pump motors through switches which are also automatically thrown over from the grid to the alternator supply. A suitable delay is incorporated to allow the diesel to run up to speed. The blower motors are put on circuit by hand so that the initial starting load on the diesel engine is not excessive. This arrangement has the advantage of flexibility, and the absence of belt drives and clutches.

(iii) *Bath*

Individual pump motor units are to be used as at Gloucester, but the standby units are turbine driven. On the occasion of power failure (which is fairly unlikely as the current is generated on the works) a no-volt switch opens up the steam supply to the pump turbines, which are kept warm and ready for immediate duty. All pump delivery lines are fitted with non-return valves, so that as the steam driven pumps shut down, these valves close.

Similar advantages may be claimed for this arrangement as the previous one.

PURIFICATION OF CRUDE SULPHUR

The price per unit quoted by an acid manufacturer for Mirfield crude sulphur was 1s., which is higher than that offered for spent oxide. A certain parcel of crude sulphur on this basis was worth £4 5s. per ton. Two methods exist of refining such crude sulphur which would enable it to command a price comparable with Gulf sulphur. One only of these methods of distillation has been tried out on a pilot plant scale at Mirfield and the experiments are still continuing.

(a) *Distillation.*—Autoclave sulphur may be charged into an iron retort and heated to 400°C. at which temperature any tar or gummy organic material is destroyed. Hydrogen combines with some of the sulphur to form hydrogen sulphide, which is evolved, the fate of the carbon being uncertain. When the evolution of hydrogen sulphide is finished, the sulphur may be distilled, condensed, and cast into blocks. This sulphur is virtually pure, containing only traces of ash and bituminous matter. On weathering some batches show a greenish cast between the crystals, presumably due to blue.

(b) *Solvent Extraction.*—This method is carried out successfully with spent oxides of chosen grade and is also applicable to the treatment of crude sulphur. There is in fact one advantage of treating crude sulphur in that the mechanical handling part of the plant, probably the most expensive and elaborate part, may be considerably simplified, because of the relative purity of the raw material.

Whether further purification of sulphur should be carried out or not depends on the local conditions at the works. On partial removal schemes, the crude sulphur may be mixed with low-sulphur spent oxides. On complete removal plants the sulphur may be sent to other undertakings to mix with spent oxide, or maybe refined. There may be a sufficiently good case economically for a centralised sulphur purification plant, receiving crude material from neighbouring works.

ECONOMIC ASPECTS

(1) *Comparison with Oxide Purification.*—Caution should be exercised in making comparisons between the cost of oxide and liquid purification. The former is a well established process, while the latter is only emerging from the development stage. As far as first-hand experience goes, of plants installed by Holmes it would appear that, in general, the cost of liquid purification is greater than that by oxide boxes. Whether in the future this state of affairs will continue is a matter of conjecture. It is certain that the cost of oxide purification tends to increase. This is mainly due to the continuing rise in labour costs for oxide handling and, in addition, increased cost of power and fresh oxide. In spite of the sulphur shortage, spent oxide commands poor prices, and sometimes the acceptance of spent oxide by purchasers is conditional on the purchase by the gas undertakings of fresh oxide from them.

TABLE 1.

OPERATING COSTS OF LIQUID PURIFICATION PLANTS.

Plant	Mirfield	North Shields	Liverpool	
Gas	H. & C.O.	H.	H.	C.W.G.
Period, days	190	26	68	66
Av. gas rate, mill. cu. ft./day	0·56	2·7	2·95	4·2
H_2S inlet, gr./100 cu. ft.	500	450	526	284
H_2S outlet, gr./100 cu. ft.	100	100	0·2*	0·7*
Copperas used, lb./mill. cu. ft.	84	104	316	174
Soda used, lb./mill. cu. ft.	184	189	321	330
Power, kW/mill. cu. ft.	171	167	738	510
Costs.	£	£	£	£
Copperas	13	11	111	82
Soda	96	65	191	278
Power	75	48	615	593
Labour	81	27	215	240
Supervision	50	26	—	—
Steam	19	8	—	—
Water	—	—	8	7
Maintenance	20	5	50	70
Total	£354	£190	£1,190	£1,270
Gross cost per 1,000 cu. ft.	0·79d.	0·65d.	1·42d.	1·10d.
Gross cost per ton sulphur removed	£12·9	£12·2	£17·7	£25·2

* These figures are parts per million.

Recently some detailed examinations have been made of the possibilities of oxide extraction by carbon bisulphide. It was proposed to build a sulphur extraction plant situated at the centre of a large group of gas undertakings to which all spent oxide would be sent for treatment. Oxide for re-use would be prepared at the central plant by mixing extracted and fresh oxide together with a suitable alkali. In two such cases which were examined it was found that the overall cost of operating such a scheme differed little from the costs already being incurred by normal practice. One showed a slight loss, the other a slight gain. Although there are several

major arguments in favour of oxide extraction, the sole point to be made here is that, economically at least, no great saving may be made by it. This was also the experience of Ruhrgas A.G. on whose considerable experience the schemes were based.

(2) *Liquid Purification Costs.*—The various items of cost of operation of a liquid purification plant will be discussed, together with the factors which influence them, and possible ways of reducing them.

Reagents must be added continuously to replace losses occurring during operation.

Copperas (crystalline ferrous sulphate) is added to the circulating liquor to form ferric hydroxide and iron blues. The main loss of iron from the system occurs when it is removed along with the sulphur sludge by froth flotation in the oxidiser. Although sulphur floats off preferentially to ferric hydroxide and iron blues, the loss is proportional to the amount of sulphur sludge—*i.e.*, to the hydrogen sulphide content of the gas. Since the latter cannot be controlled the copperas consumption varies with it in the case of a complete purification plant. With partial purification, it varies with the hydrogen sulphide removal.

The main power consumers are the liquor circulation pumps and the oxidiser air blowers. The size of the pumping load is not only related to the gas volume, but also to the type of plant. In a partial recovery plant where only one washer is used, the pumping load is considerably less than that for a complete removal plant, where six washers are used. It is not one-sixth because heavier irrigations are adopted on primary washers. The air blower load, on the other hand, is virtually the same, irrespective of the type of the plant, because the air volume required is proportional to the sulphur removed, which may be, say, 85-90% partial, or 100% complete. The efficient utilisation of the air is of prime concern and new improvements are being sought, as this cost item is high. By using two sizes of pumps and blowers, a degree of flexibility is obtained to meet variations of winter and summer gas loads. The choice between steam and electricity as a source of power depends on local works conditions.

A partial removal plant rarely needs shift operators, unless it is very large. A complete removal plant must have shift operators, irrespective of its size, and it is unwise to allow a shift operator to look after any additional plant. Hence, labour charges are fixed, and become proportionally less as the size of the plant increases. Based on experience, one man per shift should handle up to 6 mill. cu.ft. of gas per day, and up to 12 mill. if day labour is available for sulphur and reagent handling. Supervision by a shift foreman is adequate although laboratory control tests are necessary to guide him. Low pressure process steam is required for sludge treatment, and the amount is roughly proportional to the amount of sludge to be handled.

Repairs and maintenance are difficult to assess, but are probably proportional to the size of the plant, and in any case are not large. Actually, remarkably little corrosion has occurred on the plant at Liverpool during 16 months' operation.

TABLE 2.
COMPARISON OF OXIDE BOX AND LIQUID PURIFICATION COSTS.

	Oxide Boxes			Liquid Purification			
Source	† Townsend	† Townsend	A Northern Group	Mirfield	North Shields	Liverpool	Liverpool
Period	4 Years	4 Years	1 Year	190 days	26 days	68 days	66 days
Date	1944-1947	1944-1947	1949	1950	1951	1950	1950
Gas	V	H	H. & V.	H & C.O.	H.	H.	C.W.G.
Gas Volume, mill. cu. ft. ...	5·496	2·329	—	107	70	201	277
Sulphur removed, tons	2,589	744	6,375	27·4	15·6	67·5	50·3
Gross Cost, pence/1,000 cu. ft....	0·92d.	0·73d.	—	0·79d.	0·65d.	1·42d.	1·10d.
Net Costs, pence/1,000 cu. ft. ...	0·47d.	0·39d.	—	(a) 0·54d. (b) 0·38d.	0·43d. 0·29d.	1·08d. 0·88d.	0·91d. 0·80d.
Gross Cost, £/ton Sulphur ...	£8·1	£9·6	£8·6	£12·9	£12·2	£17·7	£25·2
Net Costs, £/ton Sulphur ...	£4·2	£5·0	£5·6	a) £8·6 b) £6·1	£7·9 £5·4	£13·4 £10·8	£21·0 £18·5

† Figures modernised to 1951 costs.
(a) Crude Sulphur credited at £4 5s. 0d. per ton.
(b) Sulphur credited at £8 per ton net.

Soda is lost in several ways, but mainly in the liquor associated with the sludge. Some is consumed by direct reaction with copperas, and in addition losses occur by thiosulphate formation, with hydrogen cyanide to form thiocyanates and cyanides, the latter forming iron blues. Results from Liverpool gave the following:—

	% Soda added.
Reaction with copperas	13.8
Reaction with HCN	19.4
Formation of thiosulphate	49.3
Unchanged Na_2CO_3 with sulphur sludge	15.3
Unaccounted-for	2.2
Total ...	100.0

Although soda has so far been used, ammonia is now being tried systematically. It has the advantages of cheapness and availability and may be introduced into the system by the gas itself if ammonia washing is transferred to the outlet of the liquid purification plant. In contrast with soda, up to 20% may be lost in air blowing during oxidation and its recovery entails scrubbing of the spent oxidiser air.

In general, therefore, it may be stated that the replacement of reagents is proportional to the weight of hydrogen sulphide and hydrogen cyanide removed from the gas. Thiosulphate formation is repressed by allowing the concentration of this salt to build up in the circulating liquor, but otherwise cannot be controlled.

ESTIMATION OF COST

Complete Removal.—This is usually expressed as the cost per 1,000 cu.ft. of gas treated or the cost per ton of sulphur recovered. These figures must be treated with caution as they may be influenced considerably by the volume of gas treated and the hydrogen sulphide content of the gas. For instance, if a plant is run at less than full load on a gas of given hydrogen sulphide content, both cost figures will increase, as all charges except reagents remain the same. If, on the other hand, the gas volume is maintained at full load and the hydrogen sulphide varies, the cost per 1,000 cu.ft. will remain the same, but the cost per ton of sulphur will vary inversely as the hydrogen sulphide content.

In order to deal with sudden increases of hydrogen sulphide

(*Concluded on p. 618*)

Street Lighting

By D. R. S. WATSON,
Devonport.

In this practical paper to the Western Junior Gas Association, the author gives an account of a major installation in the Devonport District of the Plymouth Unit Area of Supply, South Western Gas Board.

CONSIDERABLE importance has always been attached to street lighting in the area supplied by the Plymouth Keyham works, and past records show that the area was lit in the early days by the luminous flame. It has always been the policy of past engineers and managers not only to maintain the load obtained from street lighting, but to do their utmost to increase it. This, however, was not done without difficulty, as keen opposition from the local Electricity Department has been faced throughout the years. The following table shows how this opposition has been met and the strides which have been made in expanding and modernising gas street lighting in this area since the cessation of hostilities and the recommencement of street lighting during 1945.

	Total No. of lamps	No. of 12-lt.	No. of 6-lt.	No. of 3-lt.	No. of 2-lt.	No. of 1-lt.	No. of Comets	No. of Controllers	Ann consumption of lamps in cu. ft.
1939	2,251	52	183	88	685	1,243		516	60 mill. approx.
1945	407	28	75	67	168	69			19 mill. approx.
1950	2,774	96	180	122	1,539	837	2,594	2,774	56 mill. approx.

The lower consumption figure in 1950 as compared with the 1939 figure is due to the fact that at present 1,864 lamps are operated on a restricted hours-of-lighting basis—*i.e.*, midnight only and not all night as was the case in 1939.

Past records shows us that considerable effort has been made to standardise the types of lanterns and columns and this policy was further carried out in the post-war years when this undertaking was endowed with the task of erecting on new housing estates some 500 street lamps. It was decided that all 500 lamps would consist of the Sugg '8,000' Avenue type lamps, and these were erected on the Ministry of Transport Class 'B' roads, which were existing on the new estates.

The year 1945 saw the start of a project to convert all lamps on the district to automatic control. After this, further improvement took place by the conversion of all by-pass lamps to Comet ignition, with the exception of 6-lt suspension lamps which still retained their permanent by-pass, due to modification difficulties. Also Multi-ray reflectors were fitted to all square lanterns with the exception of lamps located in back lanes.

The 12-lt and 6-lt lamps consist mainly of the Sugg London B/2 pattern, the remainder being of the Sugg Rochester type. These provide the illumination on what are considered to be the main thoroughfares in the area of supply. With the exception of 41 3-lt Sugg '8,000' lamps and eight Maxilla Junior lanterns the remaining part of the area is lit by Foster & Pullen square lanterns mounted on cast iron or steel columns, with the light source varying from 13 to 15 ft. from ground level.

Metropolitan automatic controllers and Type 18 Newbridge controllers were the original apparatus used in the early days of automatic control, but since 1945 it has been the policy to purchase only Newbridge 3A/UNI controllers, although many of the former types are still in use. The first Comet igniters to be installed were of the Newbridge Mark III pattern, which has now been superseded by the Mark IX. When Newbridge announced changes to their designs, it was decided in the Devonport district of the Plymouth unit to modify the Mark III so as to bring it in line with the specifications of the Mark IX. This alteration necessitated the modification of the battery container, and was carried out by inserting a spring and a rectangular sleeve. All Comets now on our area use the same type of battery, thus easing the stores position.

The administration of the Street Lighting Section is part of the duties of the Deputy Distribution Superintendent of the Plymouth and Devonport units. A Street Lighting Inspector is directly responsible for the supervision of the staff employed on this work, comprising of 13 lamp attendants (one employed on suspension lamps), one gasfitter, one tinsmith (part time), one painter (part time), and one tower wagon driver. A rota exists whereby all our apprentice fitters spend a week, every second month, on street lighting duties, during which they assist the Section's gasfitter.

The work on the suspension lamps is treated as a separate item, the installations being divided into two sections, one section per week being wound, reset, and cleaned. For work of this nature we have a heavyweight tower, extending to a maximum of 22 ft., which is mounted on a 30 H.P. Ford chassis. It carries a driver and mate who are occupied on this work on five mornings per week. On the evening inspection lamps which are considered to be in need of the fitter's attention are noted, and the necessary work carried out by the fitter on the following afternoon. These complaints may be said to be within the range of three to 12 and are made up as follows, one to two faulty controllers and two to three faulty Comets, the remainder being poor supplies, which consist of naphthalene, water, and rust, and can hardly be attributed to the installation. The man who is employed on the tower during the morning, on winding and cleaning, works broken time during the afternoon, thus enabling him to carry out the above-mentioned evening inspection each day at the appropriate time.

Should it prove necessary to carry out major repairs on a suspension lamp, the lamp is removed from the district and a replacement lamp is fixed in its place. The defective lamp is then returned to the tinsmith shop and completely stripped and renovated. A system is also in existence by which there is a periodical exchange of all suspension lamps for maintenance. This system is carried out when the tower is free from its routine work.

Painting by Rota

The painting of columns is implemented during the summer months on a rota system, every effort being made to paint each column once in two years. While this work is being carried out the street lighting section has two painters at its disposal, one covering the 13 ft. columns carrying square lanterns and the other on 30 ft. columns. It has been found from experience that with 276 suspension lamps each needing the use of a tower for maintenance, and having only one tower to carry out all types of work, the time left over after normal daily routine work has been carried out is very limited. The system which has been used in the past for the painting of suspension lamps is, therefore, as follows. The painter paints the lower half of a column, using a ladder and then he returns at a later day when the tower is available and completes the upper half of the column. It is generally agreed that this is not a very satisfactory way of working; therefore,

a K.W. aluminium alloy triple extension tower ladder, with a maximum platform height of 25 ft., has been placed on order and its delivery is anxiously awaited. It is proposed to utilise this particular unit of plant almost exclusively for painting during suitable weather. It is mounted on a light trailer, thus enabling it to be towed to the area being painted and left for the individual use of the painter during the day. It is hoped that he will be able to move the trailer from one column to another without mechanical assistance.

The 2,498 square and Sugg '8,000' lamps on our area are sub-divided into 12 groups of approximately 200, one lamp attendant being responsible for the winding, setting, and cleaning of each group. The lamp attendants work a 44-hour week made up as follows:—

Monday	7.30 a.m.	to	4.30 p.m.	
Tuesday	8.0 a.m.	to	3.30 p.m.	1 hr. 30 min.—evening
Wednesday	7.30 a.m.	to	4.30 p.m.	
Thursday	8.0 a.m.	to	3.30 p.m.	1 hr. 30 min.—evening
Friday	7.30 a.m.	to	4.30 p.m.	
Saturday	8.0 a.m.	to	10.30 a.m.	1 hr. 30 min.—evening

Any lamps noted by the attendant on his evening inspection to be in need of the fitter's attention are entered on his time-sheet and posted to the works the same evening, so that it is possible for the inspector, who receives the time-sheet the next morning, to create the necessary job card authorising the work to be completed. From experience gathered over a period of years, employing various lamp attendants, it has been found that the type and number of complaints vary with the lamp attendant. Some men are more adaptable than others and are capable of carrying out a finer adjustment. From our more efficient lamp attendants, however, we find that 97% efficiency can be maintained. Each lamp attendant sub-divides his lamps into two areas and visits each area once a fortnight during daylight hours for cleaning purposes. It is considered that under normal conditions a lamp receiving the foregoing attention operates efficiently.

Together with mechanical complaints the lamp attendants report broken panes of glass. These reports are issued as jobs to the painter for his attention. A considerable number of square type lanterns manufactured by Foster & Pullen since the end of the war make use of clips, instead of putty, to retain the glass. In the event of glass secured in this way becoming broken, and if the lamp attendant is reasonably close to the works, he is permitted to remove the pane and replace it himself. He is not, however, allowed to effect any repairs to glass held in position by putty. It is of interest to note that the average replacement figure per day, of panes of glass for square lanterns is 2.11 panes. This covers all types of replacements—*i.e.*, knock-downs, malicious damage, etc.—the labour charge running out at 0.7 hours per pane.

The street lighting section has its own set of Ordnance sheets on which all the lamps are recorded, each lamp being numbered. A lamp record card is also maintained. We thus have a comprehensive record of type of lantern, controller, Comet, reflector, and number and size of mantles. We also have a complete record of every job carried out by fitters, painters, or service-layers.

Average weekly replacement figures for expendable items are:—

	Per week.
No. 2 mantles	166
Universal type mantles	66
No. 2 nozzles	12.5
Universal nozzles	6
Batteries	103

ECONOMIC ASPECTS —

(*concluded from p. 616*)

content a safety margin has to be maintained, which in itself may be uneconomic. With variations of gas load, a saving may be made, as previously stated, by using different sized pumps and air blowers.

Partial Removal.—Removal costs for reasons stated earlier are usually less than for complete removal, but it should be remembered that the cost of final oxide purification must be taken into account as well. Little is known of the cost of removing, say, less than 100 grains of hydrogen sulphide from gas by oxide boxes.

Revenue from Recovered Sulphur.—Sulphur removal from gas is a charge on the gas-making process and will apparently remain so. Even if the recovered sulphur were to command Gulf prices, this would still be true. Unless a specialised market requiring a very finely divided product could be found, liquid purification sulphur will be used for acid manufacture.

In Table 1 are some figures collected from complete and partial removal plants and in Table 2 a comparison is made with box purification. Here, Townsend's figures for oxide purification, which were for the period 1944-47, have been brought up to date by increasing the cost of new oxide by 20% and labour by 15%. Net costs of liquid purification have been computed—

(a) by taking a price of £4 5s. per ton for crude sulphur (85% S at 1s. per unit);

(b) by assuming the sulphur to be distilled and sold at £10 per ton allowing a charge of £2 per ton for processing.

In conclusion it may be said that in spite of the higher cost of liquid purification, it is more suitable for modern industrial conditions particularly with reference to labour. Secondly, it is stressed that the Liverpool plant was the first of its kind and that more modern plants based on valuable data derived from it will almost certainly show reduced operational costs. Schemes are under consideration for modernising the Liverpool plant itself.

At present prices, the recovery of sulphur from coke oven gas used in an unpurified state would be an added charge on the coking process, which would have to be met if recovery were practised in the national economy.

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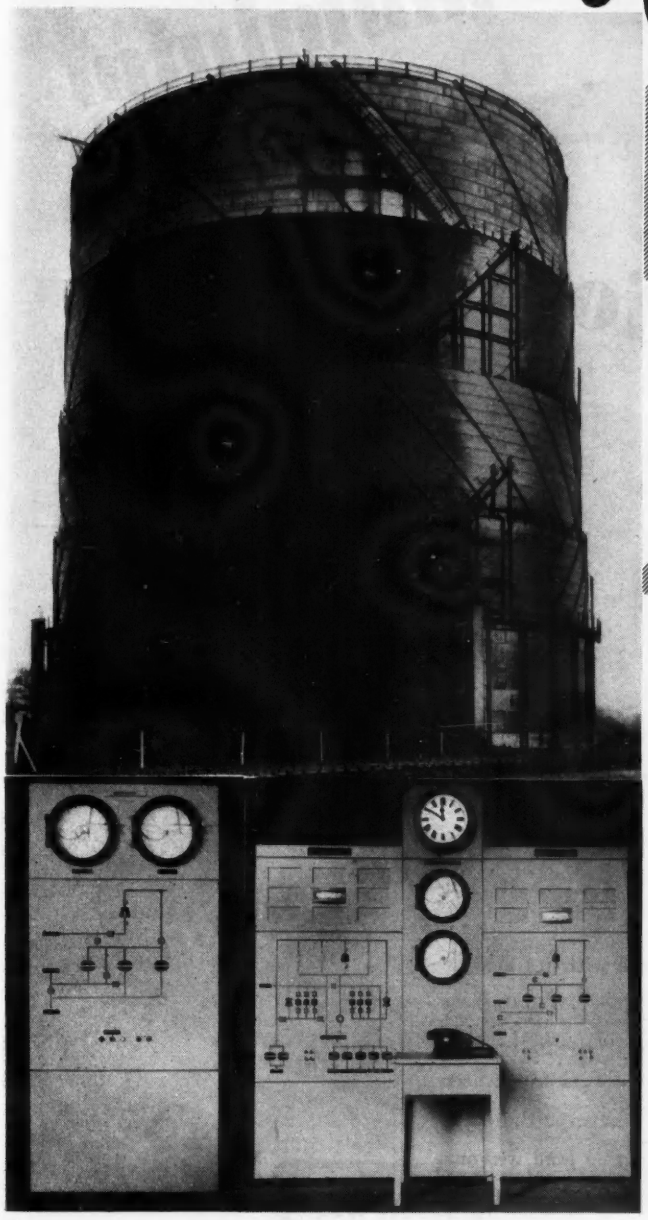
(12) The Aeration of Liquids. R. E. Pattle. Trans. Inst. Chem. E., Feb 14, 1950.

PAY INCREASE FOR GAS WORKERS

The National Joint Industrial Council for the gas industry have agreed that the rates of pay of gas workers throughout the country should be increased by 1¼d. an hour. The new rates will come into operation on Sunday, April 1. About 115,000 manual workers are affected. Craftsmen are not included. Rates of pay vary considerably between London and the provinces, and there are differential rates within the various divisions. The top labourers' rate in the provinces, now 2s. 4¼d. an hour, will be increased to 2s. 6¼d. The increase, which is based on a 44-hour week and without taking overtime or week-end rates into account, will mean an addition to the annual wages bill of about £2 mill.

Two Million Cubic feet



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With Remote Control
AT CHESTERFIELD For The
EAST MIDLANDS
GAS BOARD

Four lift spirally guided Gasholder 135′ 0″, 138′ 0″, 141′ 0″ and 144′ 0″ dia. x 34′ 6″ deep, 2 million cubic feet capacity in steel tank 146′ 6″ dia. x 35′ 3″ deep, with foundations. Gasholder controlled remotely by two land lines three miles long.

Replacing a two lift standard guided Gasholder 155,000 cubic feet capacity in steel tank.

A further contract for a Gasholder of similar capacity at the Gas Works, Chesterfield, has also been received.

Illustrated on the left are the instrument panels with line diagrams at the Gasholder Station, WHITTINGTON and CHESTERFIELD.

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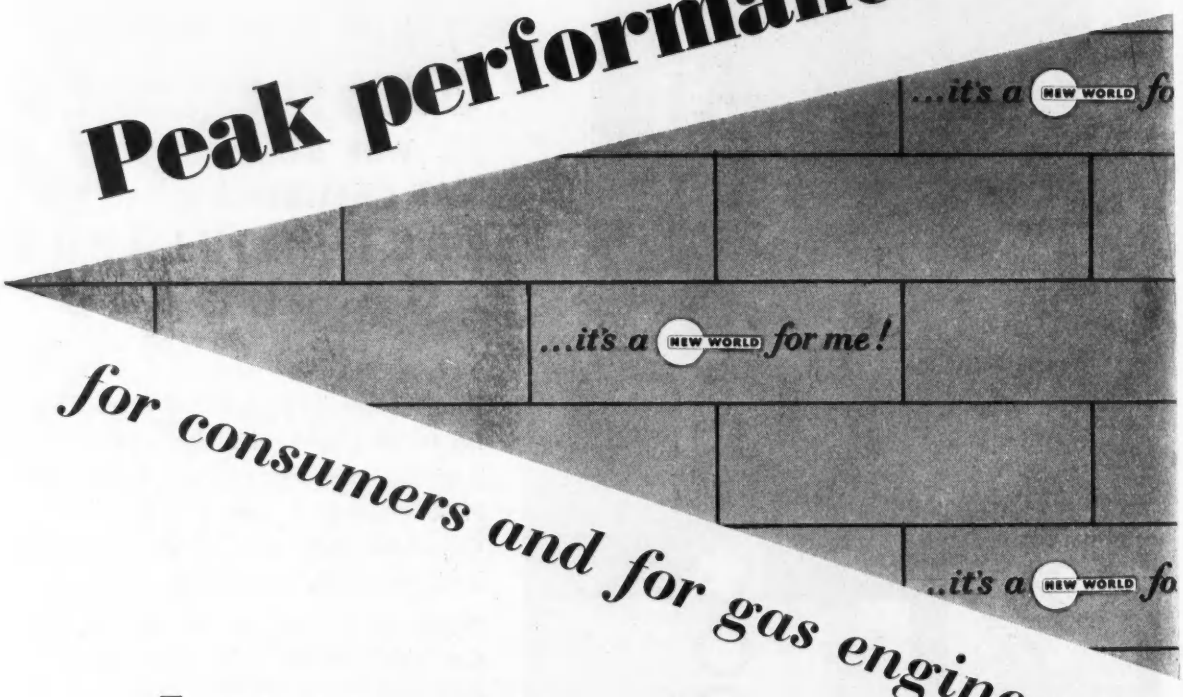

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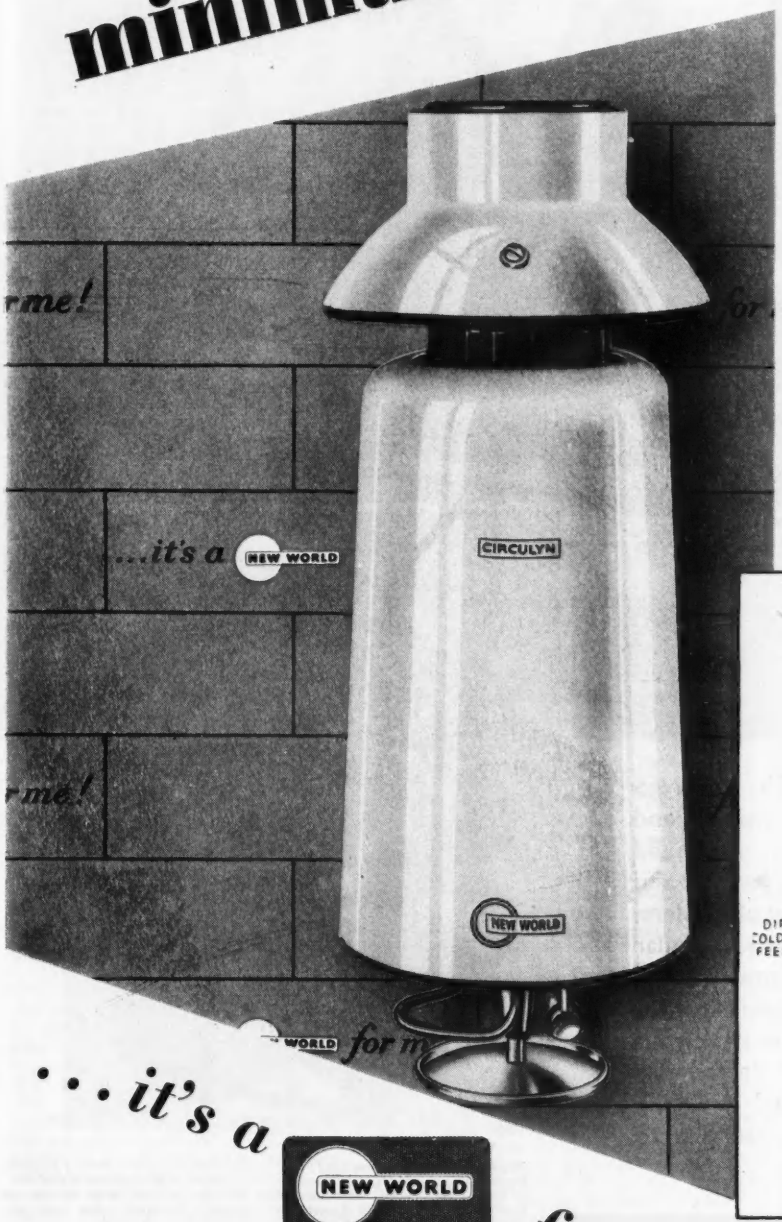
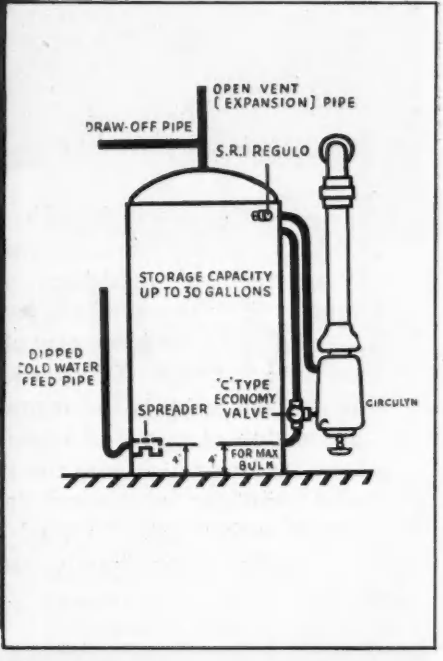
NEW WORLD NEW WORLD NEW WORLD

minimum maintenance



The CIRCULYN *reduces maintenance costs* through two noteworthy features. The first — a standard fitting — is the RADALOY heat-exchanger. RADALOY is a corrosion-resisting and heat-resisting steel alloy used for Water Heaters solely by Radiation Ltd. It has practically *eliminated the need for servicing* on gas faces. The second feature, for the hard water districts, is the NEW WORLD SCALE REDUCER which effectively reduces hard water scale. This calls for no *servicing* beyond a periodic inspection and occasional replacement of the cartridge containing the reagent.



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NEW WORLD NEW WORLD NEW WORLD

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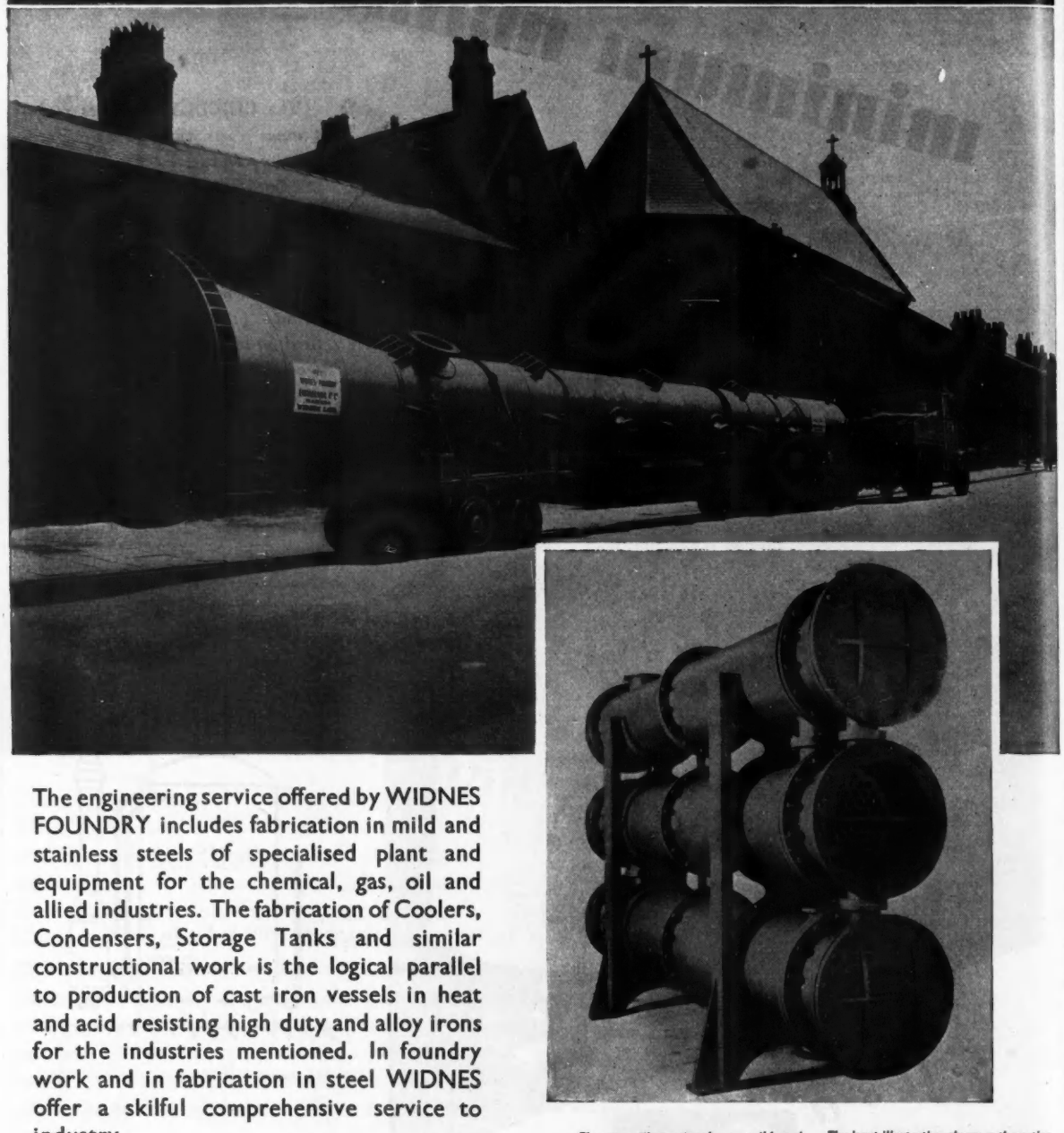

The engineering service offered by WIDNES FOUNDRY includes fabrication in mild and stainless steels of specialised plant and equipment for the chemical, gas, oil and allied industries. The fabrication of Coolers, Condensers, Storage Tanks and similar constructional work is the logical parallel to production of cast iron vessels in heat and acid resisting high duty and alloy irons for the industries mentioned. In foundry work and in fabrication in steel WIDNES offer a skilful comprehensive service to industry.

The upper illustration shows a mild steel fractionating column 4 ft. inside diameter by 58 ft. overall height, the supporting cone flared to 8 ft. 10 in. diameter in 10 ft. Approximate weight 12½ tons.

The inset illustration shows a three-tier horizontal heat exchanger in cast iron. Each shell is 20 in. inside diameter and contains 66 copper tubes 1- in. bore by 10 ft. 6 in. in length.

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COMPANY NEWS

FALK STADELMANN

The directors of Falk, Stadelmann & Co. propose to issue £100,000 4½% unsecured loan stock, and to offer to shareholders 50,000 7% £1 cumulative preference shares at 25s., and 57,750 £1 ordinary at 36s. The loan stock is being placed privately.

STAVELEY IRON AND CHEMICAL

The Staveley Coal & Iron Company, Ltd., has failed to reach agreement with the Ministry of Supply on the compensation to be paid, under the provisions of the Iron and Steel Act, in respect of its wholly owned subsidiary, Staveley Iron & Chemical, Ltd., and has therefore decided to proceed to arbitration.

RADIATION LTD.

Radiation Ltd. recommends a final ordinary dividend of 7½%, making 12½% for 1950 (same). In addition, the pre-war bonus of 2½% is restored. The last bonus was paid for 1937. Group gross profits for 1950 of £1,284,025 compare with £914,991. Deducting taxation £724,375 (£482,900), and outside interests *nil* (£546), the net balance is £559,650, against £431,545. The meeting is to be held on March 29. Dr. H. Hartley is Chairman. The ordinary rose 3s. 6d. to 60s. last week.

CORK GAS CONSUMERS' COMPANY

After providing £4,000 for depreciation, £3,260 for mortgage debenture redemption and paying an interim dividend of 3% (which absorbed £3,037) the balance of profits amounts to £7,581. It is proposed to pay a final dividend of 3% (making 6% for the year) which will absorb £3,037, leaving a credit of £4,543 to be carried forward. The Directors record with deep regret the death of one of their colleagues, Mr. T. P. Travers, since the last general meeting. The vacancy so created has been filled by the co-option of Mr. Benjamin Haughton, Chairman of the Waterford Gas Company.

INTERNATIONAL COMBUSTION

International Combustion (Holdings), Ltd., has increased its untaxed group profit from £589,279 to £907,612 and its net balance from £244,206 to £376,264. It is paying a final dividend of 15%, making 20%, less tax, on the capital of £879,245 and absorbing £96,717 net. For 1948-49 an interim of 10% was paid on 351,698 and a final of 11% on £879,245 as increased by the 150% share bonus. These payments required £72,537 net. The 1949-50 distribution is up, therefore, by £24,180 net. Group profit for the year to September 30, 1950, after providing for all charges, including taxation, amounted to £376,264, against £244,206. United Kingdom taxation absorbed £531,348, against £345,073. Profit attributable to the holding company is £350,666 (£239,628). The sum of £211,471 has been allocated to cover additional liability for income tax up to April 5, 1952, thus reducing that profit to £139,195. Net profit was struck after charging £15,738 for formation and new capital issue expenses (£6,685).

METROPOLITAN GAS METERS

A dividend on ordinary shares of 15% for the year ended September 30 (same) has been declared by the Directors of Metropolitan Gas Meters, Ltd. The group profit was £6,636 (£8,857), after charging tax of £10,983 (£11,945).

DOUGLAS GAS LIGHT COMPANY

An increase of £4,869 in the net profit of the Douglas Gas Light Co., Isle of Man, on the past year's working was stated at the shareholders' 116th annual meeting by the Chairman, Mr. R. O. Hampton, to be due to a large extent to sale of a non-recurrent character made possible by the stringency of present-day conditions. 'We were fortunate enough,' said Mr. Hampton, 'to dispose of various scrap and residues whilst clearing ground for a new holder, which in time of less shortage might have been unsaleable, or of very little value. They realised a welcome addition to our exchequer.' The actual output of gas, he said, was approximately 5% less than in 1949, although the receipts for its sales were £8,593 more. This was owing to the increase in price. Further increases in the price of gas seemed to be inevitable if additions were made to the present wages scale. Coal was a rising cost, and recently 4s. 2d. per ton had been added to it, although it was to some extent offset by an extra 6s. 3d. per ton on the sale price of coke. Both these prices,' added Mr. Hampton, 'are by direction of the Government control in England, and they extend to the island because we draw our supplies from English pits.' The works and plant were in good order and a contract had been placed for the erection of a new bench of retorts. Construction was proceeding on the new gasholder.

Gas Stock Values

Values have been fixed for the last of the composite gas and water companies whose gas assets had to be assessed for compensation when the gas industry was nationalised in 1949, the Ministry of Fuel and Power having given notice that agreement has been reached with the St. David's Water and Gas Company on the following values:

4% Redeemable Debentures (£100 unit)—compensation £101.

5% Preference Shares (£5 units)—compensation £5 10s.

Ordinary Shares (£5 units)—compensation 2s. 9d.

The date of determination of the amount of compensation was February 22. It has also been agreed that the proportion which the average net revenue earned by the gas undertaking of the Company in respect of the last three financial years before January 1, 1948, bears to the average net revenue earned in respect of those years by the Company's undertaking as a whole is 100%.

With these three securities the 62 involved in composite companies have been valued, and have required the issue of slightly over £6.5 mill. of British Gas Stock. Of the 1,944 stocks of gas companies, all but 50 have now been valued. Gas stock so far issued for compensation totals £182.1 mill., making a total for the two groups of close on £189 mill.

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METAL-TO-METAL JOINTING MATERIAL

Ever since 1913 "PERMAC," the original Metal-to-Metal jointing, has been holding up difficult joints in Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil, benzol, ammonia, etc.—screw pipe or flange.

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"Our settings were very bad, with large cracks in retorts, and portions of wall actually collapsed.
"Now, six months after repairing 28 retorts they appear as sound as ever; we anticipate the life of the settings will be prolonged."

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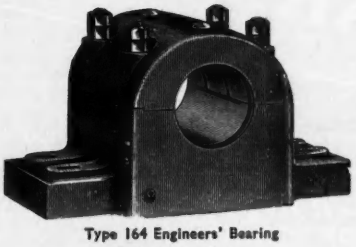

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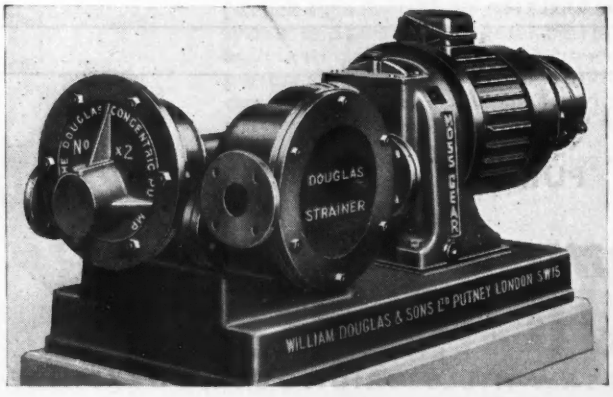

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The "Gas Journal" is published every Wednesday, price 1/-; by post 1/2d.

NEW SUBSCRIPTION and CLASSIFIED ADVERTISEMENT RATES OPERATING FROM JAN. 1, 1951.

Subscription Rates: Home and Empire :- 52/- per annum; Foreign :- 60/- per annum. (Both payable in advance.) A copy of the "Gas Journal" Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words) - minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10" deep x 7" wide; block screen 120.

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ENGINEERS required immediately for operating Continuous Tar Distillation and Ammonia Plants.
Apply: The Chemical Engineering & Wilton's Patent Furnace Co., Ltd., Horsham, Sussex.

ROBERT Cort & Son, Ltd., Mechanical Handling Engineers, Reading, require a DESIGNER DRAUGHTSMAN with considerable experience in the design of Coal and Coke Handling Plants or similar mechanical handling work. Salary £600 per annum upwards according to experience. Five room flat available.

WALES GAS BOARD

GROUP TECHNICAL ASSISTANTS.

APPLICATIONS are invited for TECHNICAL ASSISTANTS to serve the Wrexham and Cardigan Bay Groups of Undertakings of the Wales Gas Board.
Preference will be given to candidates who have had all round experience in carbonization and water gas manufacture and who hold the ordinary Grade Certificate of the Institution of Gas Engineers in Gas Engineering (Manufacture).
Applicants should be qualified by training and experience to undertake the technical supervision of gas manufacturing processes in a Group of Undertakings. Ability to drive a car is a desirable qualification.
The salary will be in accordance with Grade V of the Board's Scale of salaries (£385/465 Wrexham, £370/450 Cardigan Bay). Successful candidates will be required to pass a medical examination and will be subject to the provision of any superannuation scheme which the Board may introduce.
Applications, stating age, training, qualifications and experience, should be posted to reach Mr. J. F. Lloyd, Wrexham Group Chairman, Wales Gas Board, Gas Works, Rivulet Road, Wrexham, not later than March 27, 1951.

C. B. Mawer,
Secretary.

1 & 2, Windsor Place,
Cardiff.

EAST MIDLANDS GAS BOARD

LEICESTER & NORTHANTS DIVISION.
APPOINTMENT OF
DISTRIUTION SUPERINTENDENT.
LOUGHBOROUGH GROUP.

APPLICATIONS are invited from suitably qualified persons for the position of DISTRIBUTION SUPERINTENDENT at the Loughborough Group of Undertakings. The duties comprise the control of the Sales, Fittings and Distribution Sections of the Undertaking. The possession of the Higher Grade Certificate (Gas Supply) of the Institution of Gas Engineers would be an advantage.
The commencing salary will be within A.P.T. Grade VIII of the National Salary Scales for Gas Staffs (£490--£570 per annum), according to experience. A flat will be available for occupation under a Service Occupation agreement.
The successful candidate will be required to pass a medical examination, and the appointment will be subject to the provisions of any Superannuation Scheme that may be made for the Gas Industry.
Application stating age, training, qualifications and experience, together with the names of two referees should be forwarded to the undersigned not later than March 17, 1951.

Chas. C. Wood,
Divisional General Manager.

Millstone Lane,
Leicester.
February 26, 1951.
KR/MPS.

DRAUGHTSMAN with experience in design of water gas and producer gas plants required for contractors office in London. Pension scheme, and permanent position for suitable applicant. Apply, stating salary required, to No. 9953, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

MAINLAYING FOREMEN AND JOINTERS required for Gas Main Contracts in North West England and South Wales. Good rates of pay to fully experienced men.—Replies to: No. 9954, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WEST MIDLANDS GAS BOARD

WALSALL & DISTRICT DIVISION.
SENIOR CHEMIST—
CANNOCK GROUP OF UNDERTAKINGS.

APPLICATIONS are invited for the position of SENIOR CHEMIST at the Central Laboratory of the Cannock Group of Undertakings which comprises the Cannock, Lichfield, Tamworth and Rugeley Districts.
A sound training in plant chemical control is essential.
The salary for the post will be not less than £450 per annum on commencement, rising by annual increments to a maximum of £530 per annum in accordance with Grade VII of the salary scales of the National Joint Council for Gas Staffs.
The successful applicant may be required to pass a medical examination and will be subject to such Superannuation Regulations as the Board may, in due course, adopt.
Applications stating particulars of age, education, qualifications and experience, together with the names of two referees, should be addressed to Mr. E. Hardiker, Divisional Manager, West Midlands Gas Board, Walsall Factory Estate, Tame Bridge, West Bromwich Road, Walsall, to reach him not later than fourteen days after the appearance of this advertisement. Applicants are requested to quote ref. T.P.3. when replying to this advertisement.

F. H. Cureton,
Secretary.

WEST MIDLANDS GAS BOARD

WARWICKSHIRE DIVISION.
COVENTRY DISTRICT.
ASSISTANT—INDUSTRIAL GAS DEPARTMENT.

APPLICATIONS are invited from suitably qualified persons for the above appointment.
Candidates must be experienced in the general application of heat and have some knowledge of metallurgy as applied to industrial processes, be familiar with the designs of gas burner and gas furnace equipment and the preparation and interpretation of relative drawings; industrial consumer selling and service experience, etc.
It will be an advantage if applicants possess Higher Grade Certificates in Gas Engineering (Supply) of the Institution of Gas Engineers, or equivalent qualifications.
The salary for the post will be not less than £450 per annum on commencement, rising by annual increments to a maximum of £530 per annum in accordance with Grade VII of the salary scales of the National Joint Council for Gas Staffs.
The appointment will be subject to such superannuation regulations as the Board may, in due course, adopt, and the successful candidate may be required to pass a medical examination.
Applications, stating age, qualifications, experience and present position, together with the names of two referees, should be addressed to Mr. A. Allen, Divisional Manager, West Midlands Gas Board, Warwickshire Division, Gas Street, Coventry, to reach him not later than fourteen days after the appearance of this advertisement. Applicants are requested to quote ref. T.P.3. when replying to this advertisement.

F. H. Cureton,
Secretary.

(*Classified advertisements continued on Supplement* 4)

APPOINTMENTS VACANT (ctd.)

CHEMISTS or METALLURGISTS are invited by the Ministry of Supply to make application for an unestablished appointment in the grade of EXPERIMENTAL OFFICER at an Establishment in the London area. The duties of the post involve control of a laboratory for a coal gas factory, including test and analysis of by-products, and control of steam raising plant. Candidates should be at least 28 years of age and possess at least Higher School Certificate, or equivalent, with chemistry or metallurgy as a principal subject. Higher qualifications, particularly to degree standard, would be of advantage. Experience in fuel technology and boiler water control is necessary and some experience of steel manufacture and casting is desirable. Salary will be determined on age, and on an assessment of the successful candidate's qualifications and experience, within the Experimental Officer range £525 to £675 per annum. Rates for women somewhat lower. Application forms obtainable from the Ministry of Labour and National Service, Technical and Scientific Register, (K), York House, Kingsway, London, W.C.2, quoting F.148/51/A. Closing date March 24, 1951.
H.Q.822-25 2/51. J.C.

NORTH WESTERN GAS BOARD

LIVERPOOL GROUP.

APPLICATIONS are invited from suitably qualified engineers or chemists for appointments as ASSISTANT WORKS ENGINEERS (Grade £520/620, £570/670, £595/720, £645/770), or Principal Chemists (Grades £520/620, £570/670, £595/720) depending on qualifications. Applicants should be members of an appropriate professional body or possess a University degree together with experience in the fuel industries.

The appointments are subject to the conditions of service in the Gas Industry agreed from time to time by the National Joint Council for Gas Staffs.

The successful applicants may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applications furnishing details of age, qualifications and experience, together with the names and addresses of two persons to whom reference may be made should be forwarded to the Chief Personnel Officer, North Western Gas Board, Liverpool Group, Radiant House, Bold Street, Liverpool, 1, within 14 days of the issue of this advertisement.

SOUTHERN GAS BOARD

NORTHERN DIVISION.
AYLESBURY AND DISTRICT
GAS UNDERTAKING.

APPLICATIONS are invited for the position of WORKS FOREMAN at the Leighton Buzzard Works of the above Undertaking.

The salary will be in accordance with Grade III of the A.P.T. Scale (Provincial "B") of the National Joint Council for Gas Staffs, £235 × £15-£385, and a house will be available at reasonable rent.

Applications, giving the names of two referees, should reach the under-signed not later than March 22, 1951.

E. B. CRADDOCK, M.Inst. Gas E.,
Engineer & General Manager.

87/89, High Street,
Aylesbury,
Bucks.

SOUTHERN GAS BOARD

AREA OFFICE ACCOUNTANT.

THE Southern Gas Board wish to appoint a qualified ACCOUNTANT to work at Area Board Headquarters in Southampton. The salary range is £1,000-£1,500 per annum, and the commencing salary will be fixed according to qualifications and experience.

The appointment will be subject to such superannuation regulations as may, in due course, be made, but any existing superannuation rights in the Gas Industry will be preserved, and the successful applicant may be required to pass a medical examination.

The successful applicant will be responsible to the Chief Accountant for the day-to-day running of that part of the Chief Accountant's office dealing with general accounting and financial matters. These include the preparation of the annual accounts, taxation, rating, inter-unit bookkeeping arrangements, and preparation of routine financial statistics, although an intimate knowledge of rating or taxation is not essential. The officer appointed will be expected to work with the minimum of supervision.

The following qualifications are desirable, though not essential, and those who consider themselves specially suited to the post should apply.

(*a*) A qualified Accountant, Cost Accountant or Secretary.
(*b*) Preferably aged 30-40 years.
(*c*) Varied professional and commercial or industrial experience.

Applications should state (1) date of birth, (2) education, (3) professional training, (4) qualifications, (5) experience and positions held, and (6) present salary. Full details should be given, including experience in chronological order (with dates). Each application should be accompanied by a one-page summary, (foolscap size) giving the information indicated in items 1-6 above.

Replies, marked "Application" should be sent within ten days of the appearance of this advertisement to the Chief Accountant, Southern Gas Board, 166, Above Bar, Southampton.

SOUTH EASTERN GAS BOARD

KENT COUNTY DIVISION.
DISTRIBUTION SUPERINTENDENT,
MEDWAY GROUP (ROCHESTER, SHEPPEY,
SITTINGBOURNE AND MILTON AREAS).

APPLICATIONS are invited for the above- mentioned position. Applicants should possess the Higher Grade Certificate of the Institution of Gas Engineers and have had extensive experience in both high and low pressure gas distribution. Experience in the preparation of drawings and estimates required in distribution work, including supplies for large industrial users, is essential.

The commencing salary will be within Grade IX of the National Salary Scales (Provincial "A") in respect of Administrative, Professional and Technical Staffs, £520-£620 per annum, according to qualifications and experience.

Applications in writing (quoting reference V.10/141) giving age, present occupation, experience and qualifications, etc., should reach the undersigned not later than fourteen days after publication of this notice.

R. J. MCCRAE,
Personnel Manager.

Katherine Street,
Croydon.

PATENTS

IT is desired to secure the full commercial development in the United Kingdom of BRITISH PATENT NO. 583,033, which relates to "APPARATUS FOR TREATING GASES WITH ELECTRIC GLOW DISCHARGES" either by way of the grant of licences or otherwise on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications should apply to Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

PLANT FOR SALE

THE Liverpool Gas Undertaking has available for sale at the Southport Works a 9-ft. dia × 8 BAY ROTARY SCRUBBER WASHER capable of handling 2½/3 million, steam engine driven.

The washer is in perfect order and is lying on the site in "plate small" condition ready for removal and erection.

Apply for further details to W.S. Hubbard, Production Engineer, North Western Gas Board, Radiant House, Bold Street, Liverpool, 1.

CONTRACTS OPEN

CITY OF NOTTINGHAM

TO GAS HOLDER SPECIALISTS.

THE Sewage Disposal Committee invite Tenders for the provision and construction of a single lift spiral guided, 150,000 cubic feet capacity METHANE GAS HOLDER in steel tank together with appurtenant works to be erected at the Sewage Disposal Works, Stoke Bardolph, near Nottingham.

Plans and copies of General Conditions of Contract may be seen at, and Specification and Form of Tender obtained from Mr. R. M. Finch, O.B.E., M.I.C.E., City Engineer and Surveyor, The Guildhall, Nottingham, on payment of a deposit of Two Pounds which will be returned on receipt of a bona fide Tender.

Tenders in the official envelope supplied are to be delivered not later than 5.0 p.m. on Thursday, March 29, 1951.

The Corporation do not bind themselves to accept the lowest or any Tender.

T. J. OWEN,
Town Clerk.

Guildhall,
Nottingham.
March, 1951.

Used by the leading Gas Companies for the protection of lower plates and cuppings of Gasholders. The most efficient anti-corrosion paint in existence. HUMIDINE never cracks, never dries and is absolutely impervious to water. OXYGRAFITE GASWORKS PAINT is also manufactured by . . .

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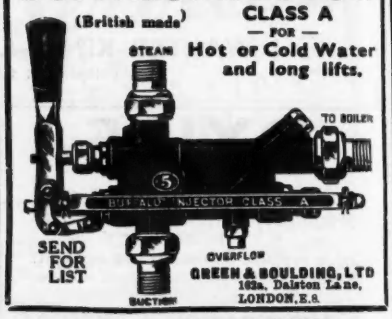

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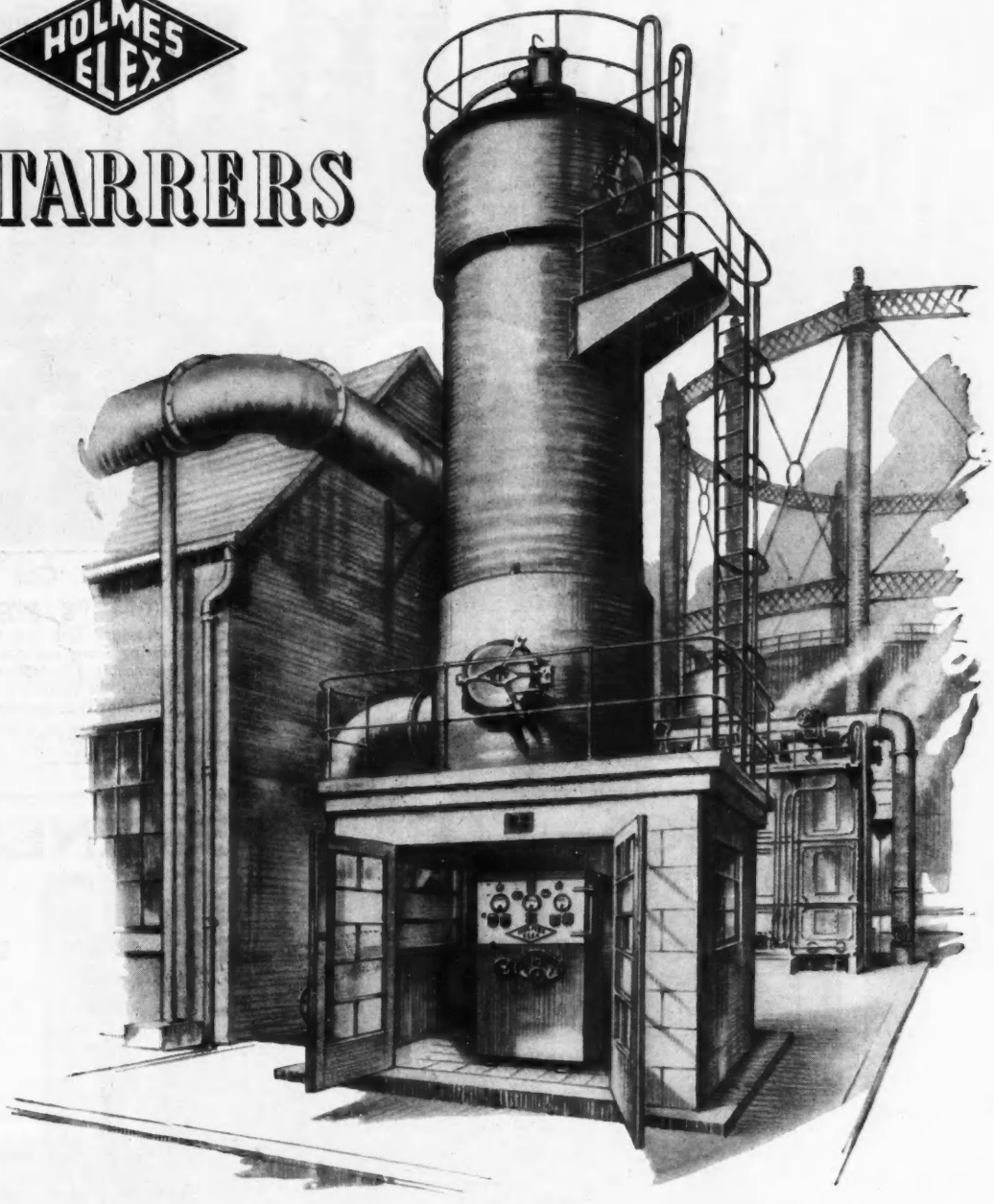
Write for Leaflets on CASE HARDENING STEEL and TEMPERING TOOLS with FLUXITE also on "WIPED JOINTS." Price 1d. each.

Fluxite Ltd. (Dept. G.J.), Bermondsey Street, S.E.1

HOLMES ELEX

DETARRERS



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The illustration shows a concentric ring burner for a 500-gal. varnish boiling pot. Made in 5 sections with 148 stainless steel burner heads. It consumes 1200 c. ft. p.h. from "K B." Mixture Controllers and Air Blower.

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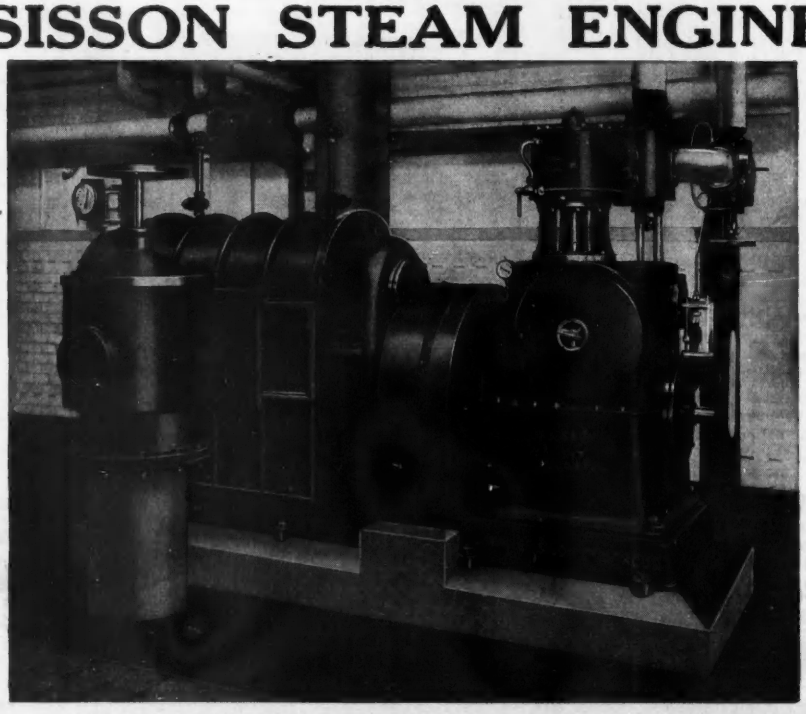

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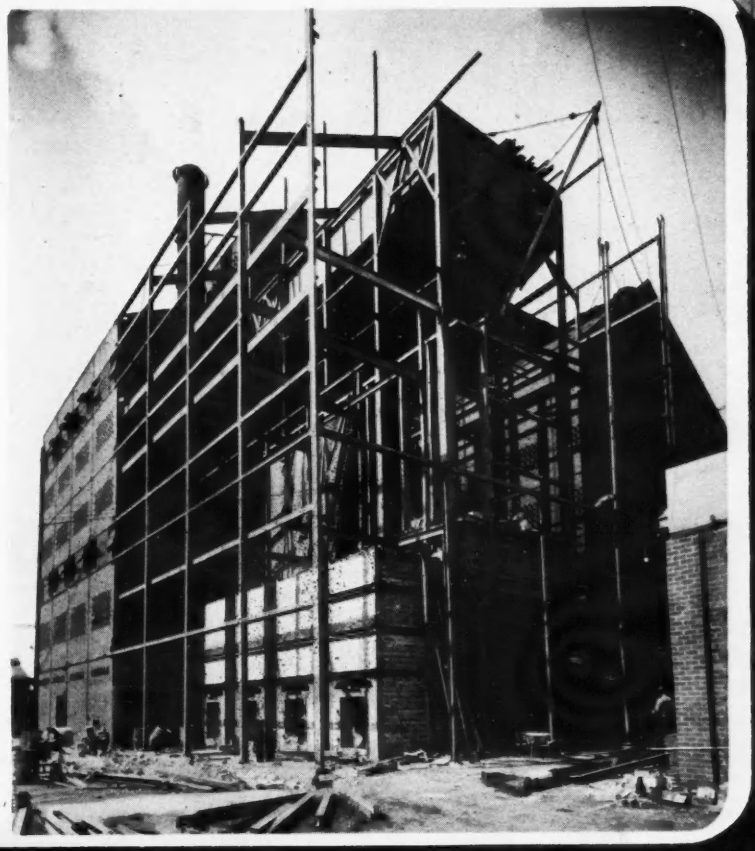
SISSON ENGINE DRIVING WALLER-ROOTS EXHAUSTER (By courtesy of Messrs. G. Waller & Son, Ltd.)

Telegrams:— SISSON. **W. SISSON & CO LTD., Gloucester, Eng.** Telephones:— 22295-6.

Printed by STRAKER BROTHERS LTD., E.C.2, for WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C.4. Wednesday, March 7, 1951.

Work in progress



FOOTSCRAY, AUSTRALIA

Since the original carbonizing plant at Footscray consisting of 24 retorts was installed in 1926, several additions have been made. The latest extension, shown here, comprises 16 retorts, bringing the total number of retorts to 80.

West's Gas
IMPROVEMENT CO., LTD.
MILES PLATTING, MANCHESTER, 10
Telephone: COLlyhurst 2961-5. Telegrams: Stoker, Manchester.
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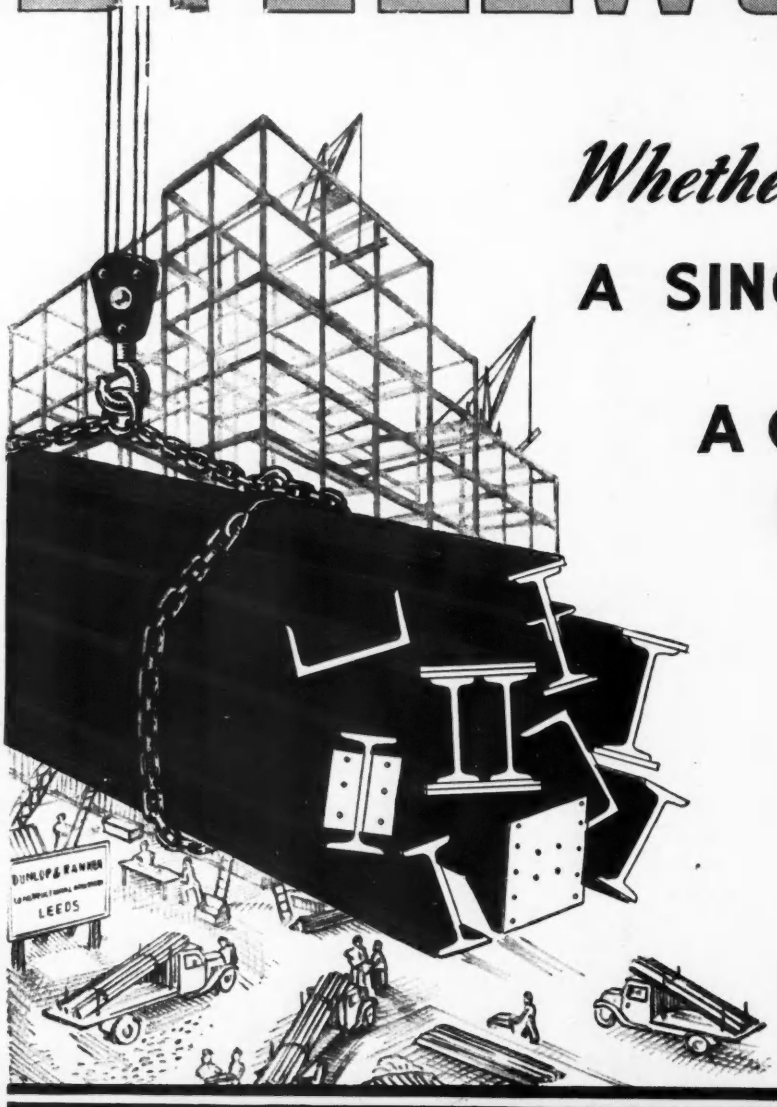
STEELWORK



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